

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Distributed System (CT 703)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Transparency is one of the important design goals of distributed system. Justify it. List out the advantages of distributed system over centralized system. [4+4]
2. What is recursive and iterative query? Describe working mechanism of DNS with suitable example. Mention the role of distributed file system. [2+3+2]
3. Define distributed object and remote interface. How RMI helps in distributed programming model? Explain with architecture. [4+5]
4. Define cuts of a distributed computation along with its types. How is casual ordering of message realized using vector clocks? [4+6]
5. Explain with example how can you achieve consensus in distributed system. Explain ricart-agrawala token based algorithm. [4+6]
6. List the challenges of replication in DS. Explain how passive replication model supports in fault tolerance. How it is differ than active replication model? [3+4+2]
7. Define flat and nested transactions. Discuss the approach of optimistic concurrency control in distributed transactions. [4+4]
8. Explain snapshot algorithm used for backward recovery in distributed system. Explain three phase commit protocol with state diagram. [6+4]
9. Write short notes on: (Any Three) [3×3]
 - a) Process and threads in a DS
 - b) ORB and its interfaces
 - c) Coordinator election process in central coordinator algorithm
 - d) Monolithic and micro kernel
 - e) MACH

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Distributed System (CT 703)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
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1. Compare centralized and distributed system in terms of their advantages and disadvantages. Explain the importance of transparency in distributed system. [5+3]
2. What is distributed file system? Explain the architecture and operations of SUN-NFS. [2+6]
3. How RMI helps in distributed programming model? Describe the strengths and weaknesses of RPC. [4+4]
4. Define the term distributed cut along with its types. Explain how clock synchronization can be done using vector clock method. [3+5]
5. Why is election algorithm needed in distributed system? Explain with example how coordinator is selected distributed system. [3+5]
6. How do you ensure high available services in distributed system? Describe various consistency models applicable in distributed system. [4+4]
7. Describe how a non-recoverable situation could arise if write locks are released after the last operation of a transaction but before its commitment. [8]
8. What are agreement protocols? What are agreement and validity objectives of Byzantine agreement problems? [2+6]
9. What are the needs and roles of atomic commitment protocol (ACP) in distributed transactions? Explain how optimistic concurrency control mechanism works. [3+5]
10. Write short notes on: (Any Two) [2×4]
 - a) MACH
 - b) RMI software
 - c) Process and Threads in DS

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Distributed System (CT 703)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
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1. What do you mean by Distributed System (DS)? Explain various models of Distributed Computing Systems. [2+6]
2. Elaborate the differences between RMI and RPC. Describe the File Service Architecture of DFS. [4+4]
3. a) What are the key differences between Network OS and Distributed OS. [4]
b) Explain the various roles of middleware in DS. [4]
4. What are the design issues on NFS? Show the complete working of DNS. [4+4]
5. Write implementation rules of Lamport clock. State the limitations of Lamport logical clock. [6+2]
6. Compare and contrast token based mutual exclusion algorithm and non-token based mutual exclusion algorithm. Explain the various state of Ricart Agrawala token based mutual exclusion. [4+5]
7. Mention the requirements and challenges of replication. Explain active replication model in fault tolerance. How it is differ than passive model? [2+4+2]
8. Discuss how Consensus can be achieved in Distributed System. Explain the check pointing approach for distributed recovery. [3+4]
9. What are the Flat and Nested Transactions? Explain how the problems of 2PC protocols are solved by 3PC. [2+6]
10. Write short notes on: (Any Two) [4+4]
 - a) JINI
 - b) Distributed Debugging
 - c) CORBA Architecture
 - d) Process Resilience

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Subject: - Distributed System (CT 703)

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1. Define Distributed System (DS). Explain the requirements to successfully implement DS to suit to modern computing. [2+8]
2. Discuss the functionalities provided by RMI software. How is the event and notification system implemented in distributed object based communication? [3+5]
3. What is distributed file system? Explain the principle operations of any one modern distributed file system? [2+7]
4. What is the issue in Lamport's timestamp? How do you avoid the issue? Explain with your alternate algorithm. [2+8]
5. How does a new coordinator elect in executing central coordinator algorithm? How to come to consensus in DS? Explain. [5+5]
6. What is fault? How to implement primary-backup replica system? How is it differ from active replication? [2+4+2]
7. What do you mean by forward and backward recovery? How to implement coordinated check pointing for recovery in DS? [2+6]
8. What are the alternative approaches to avoid possibility of deadlock in distributed system? Explain. [4+4]
9. Write short notes on: (Any Three) [3×3]
 - a. Three Phase Commit.
 - b. CORBA component for RMI
 - c. Physical Clock Synchronization: Cristian's Algorithm
 - d. Two Phase commit protocol
 - e. MACH

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Distributed System (CT 703)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
 - ✓ Attempt **All** questions.
 - ✓ **All** questions carry equal marks.
 - ✓ Assume suitable data if necessary.
-
1. What are the major goals of distributed system and what are the challenges during the design of distributed system.
 2. Define distributed objects and explain communication between distributed system.
 3. Define Distributed file system. Point out the differences between stateless and stateful services.
 4. Explain components in CORBA architecture with a diagram.
 5. Explain Lamport's logical clock with its pros and cons.
 6. Explain reliable multicast with its properties and an algorithm.
 7. Specify Data Centric consistency models and explain any one of them in detail.
 8. Why is it necessary to maintain transaction? What is a deadlock and what are phantom deadlocks.
 9. What is fault tolerance? Explain different type of faults that may occur in a distributed system.
 10. Write short notes on any two:
 - a) RPC
 - b) Monolithic and micro kernel
 - c) Mach

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Distributed System (CT 703)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
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1. Why distributed system is preferred over centralized system? Explain the layers of transparency. [4+4]
2. What do you mean by RMI software? Comparatively discuss RPC with RMI. [3+5]
3. Compare Stateful and stateless service. Describe the architecture and operation of SUNNFS with its services. [2+6]
4. Compare heterogeneous and homogeneous distributed system. Explain the CORBA architecture and its services. [3+5]
5. List the problems of Lamports clock with example. How vector clock is beneficial than Lamports clock? Explain with implementation rules of vector clock. [4+4]
6. How token system works for mutual exclusion in Distributed System. Explain with token based Algorithm. [2+6]
7. How replication is used as a basic scaling technique in distributed system? Explain the active replication model with its advantages and disadvantages. [2+6]
8. Compare nested transactions and distributed transactions. Explain the two-phase commit protocol of handling distributed transactions. [2+6]
9. What do you learn from Byzantine generals problem? Explain the basic principle of K-fault tolerant. [3+5]
10. Write short notes on: (Any two) [4+4]
 - a) Reliable Group Communication
 - b) Distributed deadlock
 - c) Forward and Backward recovery in distributed system

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1. Define distributed system? Explain Transparency Properties of Distributed System. [2+6]
2. Why naming is necessary in distributed system? Explain Sun Network File System architecture with its features. [2+6]
3. What is DNS? Explain the DNS working mechanisms with suitable example. [2+6]
4. What do you mean by DOS (Distributed Operating System)? Briefly explain the Monolithic and microkernel architectures of operation system. [2+4]
5. Define Object Adapter. Explain the invocation methods in CORBA. [2+4]
6. What is Network Time Protocol (NTP)? How Berkeley minimizes the problems of single time server failures of Chistian's algorithm. [2+4]
7. What is the need of an election algorithm? Explain non token based Ricart-Agrawala mutual exclusion algorithm along with an example. [2+6]
8. Differentiate between passive and active replication approach. Discuss with a technique that make the distributed system highly available. [3+5]
9. Write down the rule of two-version locking. Explain how Optimistic concurrency control mechanism works? [2+6]
10. How does triple modular redundancy works? Explain how reliable client server communication can be achieved in distributed system. [4+4]
11. Write short notes on: (any two) [3+3]
 - i) Lamport's clock
 - ii) TIB/Rendezvous
 - iii) Feedback suppression mechanism in M-cast communication

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1. What is True Distributed System (TDS)? How distributed system can be organized as middleware? Explain. [2+6]
2. Define Remote Procedure Call (RPC)? Describe various RPC communications semantics of client server communication in distributed system. [2+6]
3. Mention the role of stub and skeleton in distributed system. Explain the architectural details of the Network File System (NFS). [2+6]
4. What do you mean by Context Switching in distributed system? How distributed OS is different from network OS. [2+4]
5. Explain CORBA Invocation methods with its services. [6]
6. Define clock synchronization. What is the need of clock synchronization? Explain Cristian's algorithm for physical clock synchronization along with necessary diagram. [1+2+5]
7. Why Consensus is needed in DS? Explain Bully algorithm with suitable example. [2+6]
8. What do you mean by object replication? Explain process resilience approach. [2+6]
9. What are the benefits and drawbacks of using lock in Transaction Processing? Explain the lost-update problems with suitable example. [4+4]
10. What are independent checkpointing and co-ordinated checkpointing? Explain snapshot algorithm used for backward recovery in distributed system. [4+4]
11. Write short notes on: (any two) [2+2]
 - i) JINI Distributed Event Specification
 - ii) IDL
 - iii) Distributed cut

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1. Explain the major challenges in designing the distributed system. How Interaction model handles the issues in DS? [4+4]
2. What are the needs of event and notification system during the communication among distributed objects? Explain the distributed event notification process in detail. [2+4]
3. What are the major features of SUN-NFS? Explain the operation of SUN NFS with its architecture. [2+6]
4. What are the RPC Communication Semantics? Explain the component of CORBA environment. [2+6]
5. Why vector clock is important? Explain the types of Distributed cut with examples. How do you perform state recording? [2+4+4]
6. Why election algorithm is important? Explain BULLY algorithm with proper example. [8]
7. How can you claim that replication is one of the scaling techniques in distributed system? How do you ensure the high available services in DS? Explain with a suitable approach. [2+6]
8. Write the Lock compatibility rules for two-phase locking. Describe the methods for concurrency control in distributed system. [2+6]
9. Explain the types of faults and failures. How do you detect arbitrary faults? Explain with respect to Bizantine failure. [4+4]
10. Write short notes on: (Any two) [2×4]
 - a) Monolithic kernel
 - b) IDL
 - c) Check pointing approach for recovery in AS
 - d) JINI

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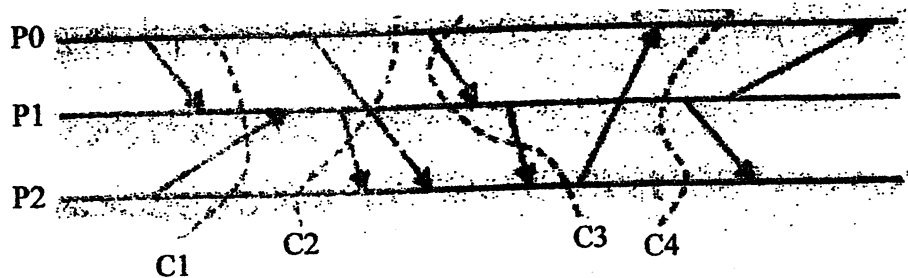
1. Why there are challenges in achieving some requirements of a distributed system? Explain the challenges associated with different requirements of distributed system. [2+6]
2. Define distributed object and IDL. Compare RPC and RMI architecture. [3+5]
3. What is stateful and stateless service in file system? Explain the DNS working mechanism with suitable practical example. [3+5]
4. What are the characteristics of distributed operating system? Explain ORB and its interfaces. [4+4]
5. Why clock synchronization is necessary? Explain the clock synchronization algorithm using vector clock along with an example. [2+6]
6. Describe non-token based centralized and Ricart Agrawala algorithm with example and compare them. [8]
7. Differentiate between active and passive replication. Explain working mechanism of active replication. [3+5]
8. How cascading aborts occurs and solved? Explain three phase commit protocol with state diagram. [8]
9. What is K-fault tolerant system? Explain fault recovery techniques. [2+6]
10. Write short notes on: (Any two) [2×4]
 - a) Distributed deadlock and recovery
 - b) MACH
 - c) Process Resilience

Exam.	New Back (2066 & Later Batch)		
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Year / Part	IV / I	Time	3 hrs.

Subject: - Distributed System (CT703)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
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1. What are the principle applications of Distributed System (DS)? Discuss the advantages and disadvantages of DS. [3+5]
2. What are the requirements of Distributed File System? Describe file service architecture for Distributed File System. [4+4]
3. a) Why naming is necessary in distributed system? Explain Domain Naming Service (DNS) with its features. [1+4]
 b) What are the advantages of micro-kernel over monolithic-kernel? In your view, which kernel is preferable for distributed Operating system and why? [2+3]
4. a) What are the components of CORBA environment? [4]
 b) What do you mean by logical clock? Explain Lamport's Logical clock. [2+6]
5. What are the principle applications of state recording and distributed debugging? Determine the types of distributed CUT in the following figure. [4+6]



6. Define distributed coordination in DS? Explain how token ring algorithm works for mutual exclusion in DS. [2+6]
7. Define replication and fault tolerance in DS and explain why are they necessary? Explain how replication enhanced scalability for DS. [6+2]
8. What is LOCK and DEADLOCK in DS? Discuss the methods of distributed deadlock avoidance. [4+6]
9. Write short notes on: [2×3]
 - i) Process Resilience
 - ii) Mach

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1. Differentiate between centralized and distributed system? Explain the design issues related to distributed system. [2+6]
2. Discuss the importance of Distributed File System (DFS). Describe the operations of SUNNFS with its properties. [2+6]
3. Explain RMI with suitable diagram. How RMI is superior to RPC? [8+2]
4. What is the role of middleware in DS? Explain about CORBA and its services. [2+8]
5. Differentiate between physical clock and logical clock. Why it is difficult to synchronize physical clock? Describe a method for physical clock synchronization. [2+2+6]
6. What are the basic requirements for mutual exclusion in distributed system? Explain the non-token based distributed mutual exclusion algorithm and compare it with token based algorithm. [2+8]
7. What are the reasons for Replication? Explain active replication model with its advantages and disadvantages. [3+5]
8. What do you mean by nested transactions? Explain optimistic concurrency control method with its advantages over other concurrency control methods. [2+4+2]
9. Write short notes on: [4+4]
 - i) Distributed OS
 - ii) JINI

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1. What is Distributed System? Discuss the challenges of Distribution System with example. [2+6]
2. Mention the role of IDL and middleware in Distributed System. Explain RMI approach in the distributed object based system. [4+6]
3. Define DFS. How does DFS encourage sharing a storage device? Explain with the help of suitable architecture. [8]
4. How threads differ from process? How does checkpoint help in recovery? What does distributed commit refer to? [4+2+2]
5. Define flat and nested transaction. Discuss the approach of optimistic concurrency control in distributed transactions. [4+6]
6. Why it is difficult to synchronize physical clock? Explain how clock synchronization can be solved using logical clock. [2+6]
7. What are the reasons for replicating the service provide? Discuss about fault tolerant services. [4+4]
8. How cascading aborts occurs and can be solved? Explain the needs and roles of atomic commit protocol in distributed system. [8]
9. Write short notes on: [4×3]
 - a) Christian's Algorithm
 - b) Recovery approach in Distributed System
 - c) CORBA services
 - d) Monolithic and Microkernel

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1. "Distributed system acts as a single coherent system to its end user." Justify the statement with its features and challenges. What is fundamental model? [6+2]
2. Define DFS. How RMI perform communication between distributed objects? Explain. [2+6]
3. Verify with proper explanations that DNS is a distributed hierarchical database system. [10]
4. Write the importance of election algorithm. Explain BULLY algorithm with suitable example. Compare it with Ring based algorithm. [8]
5. List the goals of JINI. What are CORBA services? How does operating system support for distributed system? [4+2+2]
6. Explain with algorithmic steps, how token ring algorithm works for mutual exclusion in distributed system. [10]
7. Explain Byzantine general problem to handle faulty process with example. Describe any one failure recovery technique. [8]
8. Define lock in concurrency control. How can concurrency be controlled in distributed transactions? What situation does lead to distributed deadlock? [1+4+3]
9. Write short notes on: [3×4]
 - a) Heterogeneity in distributed system
 - b) Rendezvous concept and implementation
 - c) Flat versus nested locks
 - d) Process Resilience

Exam.	New Back (2066 & Later Batch)		
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Subject: - Distributed System (CT703)

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- [1] Discuss the properties of Distributed System (DS). How interaction model addresses the relevant issues in DS? [6+2]
- [2] What is the importance of IDL in RMI? Write the operation of static RMI. [3+5]
- [3] What are the characteristics of SUN-NFS? Discuss with its architecture. [3+5]
- [4] What are the common problems of physical clock synchronization algorithms? Write Chandy-Lamport's algorithm for recording global states in Distributed System. [3+5]
- [5] Measure the performance issue of non-token based Ricart-Agrawal Algorithm. Write alternate algorithm to address those performance issues. [2+6]
- [6] How to come to consensus in DS? Discuss with an approach, how do you make the distributed system service highly available? [3+5]
- [7] What are the relationships between parent and child transactions in DS? Write the problems of locking with the solutions to avoid it. [4+8]
- [8] How do you avoid faults in DS? Compare independent checkpointing with coordinated checkpointing approach. [4+4]
- [9] Write short notes on (**Any Three**) [4+4+4]
 - [a] Monolithic and Micro-Kernel
 - [b] Services provided by CORBA with the functions of Object Adapter
 - [c] Two Phase Distributed Commit
 - [d] Distributed Debugging.
 - [e] RPC communication semantics

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1. Define Distributed System, What are advantages and disadvantages of distributed system? [2+6]
2. Draw and explain distributed file service architecture. How does that architecture encourage the sharing of storage resources in distributed system? Explain. [6+2]
3. Differentiate between RPC and RMI. How does modern RPC maintain the transparency in distributed system? [2+6]
4. Compare process and threads. Why threads are important in distributed System. [2+2]
5. Give an example of heterogeneous model of distributed application. How is distributed operating system realized in practical distributed systems? Explain. [2+4]
6. What do you mean physical and logical clocks? Explain Network Time Protocol and Berkeley Algorithm for physical clock synchronization. [2+4+2]
7. How does mutual exclusion help in co-ordination in distributed system? Explain the way how Lamport algorithm ensures mutual exclusion? [2+6]
8. What are the major objectives for replication in distributed system? Explain primary backup model for fault tolerance. [3+5]
9. Differentiate between nested transaction and distributed transaction with examples. How is commitment ensured in distributed transactions? [2+6]
10. What do you mean by fault tolerant system? What do you mean by Byzantine Failure? Explain Byzantine Generals problem to illustrate how agreement can be reached in faulty system. [1+2+5]
11. Write short notes on: [3+3]
 - a) Comparison of CORBA and Mach
 - b) Timestamp ordering in concurrency control

Exam.	New Batch (2066) & Old Batch		
Level	BE	Full Marks	80
Programme	BCI	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Distributed System (CT703)

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1. How do you define Distributed System? Explain with the model, how hardware, data and controls are distributed in the distributed system environment. [2+6]
2. Explain the ways how distributed objects communicate with each other. Differentiate between RPC and RMI. [4+4]
3. Define distributed file system. Draw and explain distributed file service architecture in detail. [2+6]
4. Differentiate between homogeneous and heterogeneous distributed applications with example. [4]
5. Compare physical clocks and logical clocks with its implementation semantics. Describe Lamport's timestamp algorithm with its benefits and drawbacks. [2+6]
6. Explain any one election technique in Distributed System. Discuss with steps how consensus can be achieved in Distributed System. [5+3]
7. How do you say that replication is one of the scaling techniques in Distributed System? How to handle concurrent invocations with object replication in distributed object based system? [2+4]
8. What are the roles of atomic commitment protocol (ACP) in distributed transactions? Explain the different methods of concurrency control in distributed transactions. [2+6]
9. What are the dependability requirements of fault tolerant system? What do you mean by K-fault tolerant? How to come agreement in faulty system? Explain with the approach of byzantine generals problem. [2+2+4]
10. Write different services provided by CORBA. What are dynamic and static invocation approaches of CORBA. [2+4]
11. Write short notes on: [4+4]
 - a) Process and threads in OS
 - b) Distributed commit

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1. What are the major goals of distributed system? Explain the need of transparency in distributed system along with the challenges in achieving that. [4+4]
2. How do you convince that middleware plays the important role in Distributed System? Explain the operation of RPC in client server communication in Distributed System. [3+5]
3. What do you mean by file and directory service? Explain the operation of SUN NFS with its architecture. [3+5]
4. Why network operating system (NOS) is widely preferred over distributed operating system (DOS) in practical distributed systems? Explain DOS as a middleware. [4+4]
5. Define logical and physical clocks. Explain Lamport timestamp algorithm along with an example. [2+6]
6. Present a practical scenario where you need an election algorithm. Explain an election algorithm with example that is suitable to your scenario. [2+4]
7. Compare passive replication with active replication approach. Also discuss with a technique that make the distributed system service highly available. [2+4]
8. What do you mean by Distributed Deadlock? Explain the two-phase commit protocol of handling distributed transaction. [2+5]
9. What are the flat and nested transactions? Describe the methods for concurrency control in distributed system. [3+4]
10. What do you mean by faults, failures and errors? How do you handle faults in Distributed System? Explain process resilience approach in brief. [2+2+4]
11. What is IDL? Explain CORBA RMI with its services. [2+4]

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Subject: - Computer Network (CT 702)

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- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Compare the OSI reference model and TCP/IP reference model mentioning their similarities and differences. [8]
2. What is switching and multiplexing? Explain switching technique used in modern computer networks. [4+4]
3. How CSMA/CD works? Describe Ethernet (IEEE 802.3) frame structure with function of each field. [4+4]
4. Why do we prefer a switch as networking device instead of Hub for LAN connection? Give reasons. Discuss the characteristics of a good routing algorithm. [4+4]
5. An ISP provided you an IP address block of 172.24.96.0/21. Suppose you need to divide this for four different departments A, B, C and D having 750, 200, 500 and 45 hosts respectively with minimum wastage of IP addresses. Also allocate IP addresses for three point-to-point links in the network. Find out the network address, broadcast address, subnet mask and usable host range of IP addresses for each subnet. [8]
6. What are the features of UDP protocol? In which case is UDP preferred as a transport layer protocol? Discuss with practical examples. [4+4]
7. What is DNS? Why is it used? How is the DNS request from a client computer resolved from the authoritative server? Explain with necessary diagrams. [2+2+4]
8. What are the problems of IPV4? How can IPV6 reduce these problems? Explain header translation mechanism for transition from IPV4 to IPV6. [2+2+4]
9. What is a digital signature? Encrypt the message "PANDEMIC" using RSA algorithm. Also obtain the plaintext from the ciphertext. [1+7]
10. Write short notes on: (Any Two) [2×4]
 - a) ALOHA
 - b) OSPF
 - c) VPN

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Network (CT 702)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Explain briefly the architecture for client-server network model with example. What do you mean by protocol hierarchies and how is "header and trailer addition" done? [3+5]
2. What are the factors to be considered while selecting media? Compare different types of guided transmission media with appropriate figures. [2+6]
3. What are the services provided by data link layer? Explain CRC with an example. [2+6]
4. Define routing. Why do we use dynamic routing? Explain the operation of link state routing protocol. [1+2+5]
5. How can you dedicate 5, 60, 115, 12 and 14 IP address to the five departments from the pool of class C IP address 192.168.10.0/24 with minimum loss? [8]
6. What are the functions of Transport layer? Explain the TCP segment format in detail. [3+5]
7. What is function of proxy server? Explain the working of FTP in detail. [2+6]
8. Distinguish between IPV6 and IPV4 packet routing. Explain about Dual stack and translation in IPv6. [2+6]
9. What is cryptography? Differentiate between DES and AES. Explain AES with an example. [1+2+5]
10. Write short notes on: (Any Two) [2×4]
 - a) ATM Architecture
 - b) DHCP
 - c) Open and closed loop congestion control

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Network (CT 702)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. How does the client-server model work? Differentiate it with peer-to-peer network with advantages and disadvantages. [3+5]
2. Define Throughput. A network with bandwidth of 20 Mbps can pass only an average of 18,000 frames per minute with each frame carrying an average of 20,000 bits. Calculate the throughput of this network. Differentiate between Packet switching and Virtual Circuit switching. [1+3+4]
3. Explain Go-back-N ARQ and selective Repeat ARQ with example. How carrier sense multiple access with collision detection (CSMA/CD) is better than CSMA? [4+4]
4. Consider IP block of 202.50.0.0/24 and six departments with 125, 59, 27, 14, 4 and 2 hosts respectively. Perform the subnetting so that wastage of IP addresses is minimum and find out the subnet mask, network address, broadcast address, wasted IP addresses and usable host ranges in each network. [8]
5. Define routing algorithm. List out the properties/goals of routing algorithm. What is link state routing algorithm? Show how routing tables is populated in LSR with example. [3+5]
6. What are services provided by Transport layer? Explain about Leaky-Bucket algorithm for congestion control? [3+5]
7. What are resource records in DNS? Explain the types of DNS queries with example. [3+5]
8. List advantages of IPv6 over IPv4. Explain any two suitable transition strategies for IPv4 to IPv6. [2+6]
9. Write down the steps involved in RSA encryption algorithm. Encrypt the word "Computer" using RSA algorithm. [8]
10. Write short notes on: (Any Two) [2×4]
 - a) Frame relay
 - b) TCP sliding window
 - c) HDLC

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

Exam.	Regular		
	Level	BE	Full Marks
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Network (CT 702)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What is protocol? What are the reasons for using layered network architecture? Compare OSI with TCP/IP reference model. [1+2+5]
2. What is transmission medium? Explain different transmission medium with their merits and demerits. [1+7]
3. What is collision? How is it occurred? How the possibility of collision is reduced in IEEE 802.3 and IEEE 802.11? Explain. [1+1+6]
4. Suppose your company has leased the IP address of 222.70.94.0/24 from your ISP. Divide it far five different departments containing 50, 30, 25, 12, 10 no of hosts. There are also two points to point links far interconnection between routers. List out the network address, broadcast address, usable IP address range and subnet mask for each subnet. Also mention the unused range of IP addresses. [8]
5. What is the purpose of Time to live (TTL) and protocol field in header of IPv4 datagram. Which protocol is used in internet layer to provide feedback to hosts/routers about the problems in the network environment? What is ARP and how does it work? [4+1+3]
6. What are the major task of transport layer? Explain. What is token bucket algorithm? [5+3]
7. What is DNS? Explain the working principle of DNS with a proper diagram. Compare IMAP and POP3 protocols. [1+4+3]
8. "IPv4 and IPv6 coexistence" what does this mean? Explain Dual stack approach with an appropriate figure. [3+5]
9. How does a Digital Signature work? Encrypt the world HELLO using RSA algorithm. Also decrypt it by showing steps. [2+6]
10. Explain briefly the desirable properties of secure communication. Explain how packet filtering firewall works. [4+4]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Network (CT 702)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What are the features of Client/Server Architecture? What are headers and trailers and how do they get added and removed? [4+4]
2. Why the telephone companies developed ISDN? Explain the working principle of ISDN with its interface and functional group. [2+6]
3. Explain the working principle of CSMA/CD with appropriate figure. [8]
4. Institute of Engineering has six departments having 16, 32, 61, 8, 6 and 24 computers. Use 192.168.1.0/24 to distribute the network. Find the network address, broadcast address, usable IP range and subnet mask in each department. [8]
5. What is routing? Differentiate between distance vector and link state routing algorithms. [2+6]
6. Explain the TCP segment structure. Why TCP is known as reliable protocol and also describe how reliability is provided by TCP? [4+4]
7. What is TFTP? Explain working principle of FTP with data transfer process including proper port connection. Use proper diagram to justify your answer. [2+6]
8. List the advantages of IPv6 over IPv4. Explain any two transition strategies for IPv4 to IPv6. [2+6]
9. List the properties of secure communication. Encrypt and decrypt "ROSE" using RSA algorithm. [2+6]
10. Write short notes on: (Any two) [4+4]
 - a) Firewall and their types
 - b) 803 Token Bus
 - c) Virtual circuit switching

Exam.	Back		
	Level	BE	Full Marks
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Network (CT702)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Why layering is important? Explain design issues for layers in detail. Mention service primitives for implementing connection oriented service. [2+4+2]
2. Compare circuit switching and packet switching. Explain ISDN channels with architecture. [3+5]
3. State the various design issues for the data link layer. What is piggybacking? A bit string 01111011111101111110 needs to be transmitted at the data link layer. What is the string actually transmitted after bit stuffing? [3+3+2]
4. Why routing is essential in computer networking? Compare working of distance vector routing algorithm with link state routing algorithm. [3+5]
5. Design a network for 5 departments containing 29, 14, 15, 23 and 5 computers. Take a network example IP 202.83.54.91/25. [8]
6. What are the differences between TCP and UDP services? Explain the TCP datagram format in detail. [3+5]
7. Define socket programming. How web server communication and file server communication are possible in network. Explain with used protocols. [6+2]
8. What are the methods used to interoperate IPv6 and IPv4. Show IPv6 datagram format. [6+2]
9. What is VPN? Encrypt a message "network" using RSA algorithm. [2+6]
10. Write short notes on: (any two) [4+4]
 - i) Flow control in D22
 - ii) X.25
 - iii) ALOHA

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
	Level	BE	Full Marks
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Network (CT 702)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Draw the architecture for Client/Server network model. Explain in details about P2P network model with supportive examples. [2+6]
2. What is switching? What are the various switching techniques? Elaborate packet switching with a proper diagram. [1+2+5]
3. What are multiple access protocols? Describe the various framing techniques at data link layer. [2+6]
4. Suppose you are a private consultant hired by the large company to setup the network for their enterprise and you are given a large number of consecutive. IP address starting at 120.89.96.0/19. Suppose that four departments A, B, C and D request 100, 500, 800 and 400 addresses respectively, how the subnetting can be performed so, that address wastage will be minimum? [8]
5. What do you mean by autonomous system? Explain how routing loops are prevented in Distance Vector Routing with examples. [2+6]
6. Explain connection establishment and termination in TCP. Explain briefly about Leaky-Bucket algorithm for congestion control? [4+4]
7. Why we need proxy servers? What are the importance of DNS and HTTP(S) while you are browsing any website? [2+6]
8. "IPv4 and IPv6 coexistence" what does this mean? Explain what you mean by address family translation in IPv4/IPv6 migration process with an appropriate figure. [3+5]
9. Explain briefly the desirable properties of secure communication. Explain how Packet filtering firewall Works. [4+4]
10. Write short notes on: (Any two) [4+4]
 - a) Digital Signature
 - b) VPN
 - c) Symmetric key cryptography

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Network (CT702)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. Distinguish between Client-Server network and Peer-Peer network. Explain Open System Interconnection (OSI) model. [3+5]
2. Define transmission media. Compare among Twisted Pair, Coaxial cable and Fiber optic. [3+5]
3. What is the main functionality of data link layer? Differentiate between circuit switching and packet switching. [4+4]
4. Mention the criteria for good routing. Explain RIP, OSPF, BGP, IGRP and EIGRP. [2+6]
5. How can you dedicate 32, 65, 10, 21, 9 public IP address to the departments A, B, C, D and E respectively form the pool of class C IP addresses with minimum loss. Explain. [8]
6. How connection is established and released in TCP. Explain Token Bucket algorithm. [4+4]
7. Which protocols are used in sending and receiving an email? Illustrate with necessary figure. Give a comparison of POP3 and IMAP. [5+3]
8. What are the factors that lead to the speedy development of IPv6? Define the process of transition from IPv4 to IPv6. [4+4]
9. Define type of Encryption used in security. How PGP can secure email communication? [5+3]
10. Write short notes on: (any two) [4+4]
 - i) Types of firewalls
 - ii) FDDI
 - iii) Socket programming

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Network (CT702)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What is the significance of OSI layer? Explain different layers of OSI with its functionalities. [2+6]
2. Define switching and multiplexing. Explain about any two guided transmission media in detail. [2+6]
3. What are the causes of packet delay in computer networks? What are the differences between circuit switching and packet switching? [2+6]
4. What is classful and classless address? Differentiate between link state and distance vector routing protocol. [8]
5. Suppose you are a private consultant hired by a company to setup the network for their enterprise and you are given a large number of consecutive IP address starting at 120.89.96.0/19. Suppose that four departments A, B, C and D request 100, 500, 800 and 400 addresses respectively, how the subnetting can be performed so that address wastage will be minimum? [8]
6. Explain the TCP protocol with its Header. What do you understand by socket? Explain with its importance. [5+3]
7. What is recursive and iterative query? Explain with suitable diagram. Discuss the DNS records. [6+2]
8. List the advantages of IPv₆ over IPv₄. Explain header translation and tunneling approach used for migrating IPv₄ to IPv₆. [4+4]
9. Explain briefly the desirable properties of secure communication. Explain how Packet filtering firewall Works. [4+4]
10. Write short notes on: (Any two) [4+4]
 - a) SMTP and POP
 - b) Diffie Hellman's Algorithm
 - c) CSMA/CD
 - d) DLL Flow Control Mechanisms

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Network (CT702)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What are the reasons for using layered protocols? What are headers and trailers and how do they get added and removed? [3+5]
2. Why do you think that static channel assignment is not efficient? Explain about the operation of Carrier Sense Multiple Access with Collision Detection. [2+6]
3. What is meant by byte stuffing technique? What is piggy backing? Suppose a bit string, 011110111110111110, needs to be transmitted at the data link layer. What is the string actually transmitted after bit stuffing? [3+2+3]
4. Why do we think that there arised the need of classless IP address although class based IP address was in used? Show the classless IP with an example. [4+4]
5. Suppose we have 4 departments A, B, C and D having 25 hosts, 16 hosts, 29 hosts and 11 hosts respectively. You are given a network 202.70.91.0/24. Perform the subnetting in such a way that the IP address wastage in each department is minimum and find out the subnet mask, network address, broadcast address and usable host range in each department. [8]
6. Explain the differences between TCP and UDP. How congestions can be handled using Token Bucket? Explain with proper diagram. [8]
7. For the client-server application over TCP, why must the server program be executed before the client program? TCP is known as reliable process, describe how reliability is provided by TCP. [3+5]
8. "IPv4 and IPv6 coexists" what does this mean? Explain Dual stack approach with an appropriate figure. [3+5]
9. What are the attributes of information Security? Explain the operation of RSA algorithm. [4+4]
10. Write short notes on: (Any Two) [4+4]
 - a) DHCP
 - b) Firewall
 - c) DNS

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Network (CT702)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. Differentiate between TCP/IP and OSI Model. Define Frame Relay in detail. [5+3]
2. What do you mean by switching in communication? Compare switching with multiplexing. Explain the E1 Telephone hierarchy system. [2+2+4]
3. What do you understand by Media Access Control? What is its significance in data link layer? Explain why token bus is also called as the token ring. [2+2+4]
4. You are a private contractor hired by the large company to setup the network for their enterprise and you are given a large number of consecutive IP address starting at 202.70.64.0/19. Suppose that four department A, B, C and D request 100, 500, 800 and 400 addresses respectively, how the subnetting can be performed so, that address wastage will be minimum? [8]
5. Discuss about the network congestion? Explain how different network parameters effect the congestion. Compare operation of link state routing with the distance vector routing. [2+2+4]
6. How web server communication and file server communication are possible in network, explain with used protocols. Define socket programming. [6+2]
7. What are the factors that lead to the development of IPv6? Define the process of transition from IPv4 to IPv6. [4+4]
8. Compare symmetric key encryption method with asymmetric key encryption. Explain RSA algorithm with example. [3+5]
9. What do you mean by firewall? Explain different types of firewall. [2+6]
10. Write short notes on: [4×2]
 - i) HDLC
 - ii) Web Server

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Network (CT702)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. Compare OSI layer with TCP/IP Layer? Explain in which level of OSI layer following tasks are done. [5+3]
 - i) Error detection and correction
 - ii) Encryption and Decryption of data
 - iii) Logical identification of computer
 - iv) Point-to-point connection of socket
 - v) Dialogue control
 - vi) Physical identification of computer
2. Explain five instances of how networks are a part of your life today. Through we have MAC address, why do we use IP address to represent the host in networks? Explain your answer. [5+3]
3. Briefly explain different types of Data Link Layer framing mechanisms. List the features of FDDI. [8]
4. Explain how can you allocate 30, 24, 25 and 20 IP addresses to the four different department of ABC company with minimum wastage. Specify the range of IP addresses, Broadcast Address, Network Address and Subnet mask for each department form the given address pool 202.77.19.0/24. [8]
5. What is routed and routing protocol? Give examples. Explain Token Bucket algorithm. [4+4]
6. For the client-server application over TCP, why must the server program be executed before the client program? TCP is known as reliable process how, describe reliability is provided by TCP. [3+5]
7. Compare the header fields of IPV6 and IPV4. Which method do you suggest for the migration of IPv6 and why? [4+4]
8. Explain briefly how firewalls protect network and also explain different types of Firewall. Illustrate your answer with appropriate figures. [8]
9. Write down the steps involved in RSA encryption algorithm. Encrypt the word CAT using RSA algorithm, choose the suitable data for encryption by yourself according to RSA algorithm. [8]
10. Write short notes on: [4×2]
 - a) Simple Mail Transfer Protocol
 - b) Doman Name Server

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Network (CT702)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. You are assigned to design a network infrastructure for a 3-star hotel. Recommend a network solution with hardwares and softwares in current trend that can be used in the hotel. Make necessary assumptions and justify your recommendation with logical arguments where possible. [8]
2. List out the functions of physical layer in TCP/IP reference model. Explain different types of transmission media. [2+6]
3. What are the functions of data-link layer? Explain the channel allocation problem with example. [3+5]
4. What are the functions of network layer? Explain briefly about multicast routing protocols and unicast routing protocols. [2+6]
5. Network layer is one of the key layers in OSI reference model, why? Differentiate between distance vector routing and static link routing. [2+6]
6. What is a TCP connection? Explain how a TCP connection can be gracefully terminated. [2+6]
7. What are the different components of email server? Explain different types of electronic mail sending and accessing protocol. [2+6]
8. What is IPV6? What methods are used so that IPV6 and IPV4 networks are interoperable? [2+6]
9. What is firewall? What are their types? Encrypt and decrypt "OVEL" message using RSA algorithm. [1+1+6]
10. Write short notes on: [4×2]
 - a) Digital signature
 - b) IPSec

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Network (CT702)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
 - ✓ Attempt All questions.
 - ✓ The figures in the margin indicate Full Marks.
 - ✓ Assume suitable data if necessary.
1. What do you mean by network architecture? Compare TCP/IP and OSI reference models. Explain X.25 Network with its key feature. [2+3+3]
 2. What is ISDN? Explain about the ISDN architecture in detail with example. [2+6]
 3. What are multiple access protocols? Explain how multiple access is achieved in IEEE 802.5. [2+6]
 4. What is network security? Explain Virtual Private Network (VPN) with an example. [2+4]
 5. You are given the following address space 10.10.10.0/24. You have to assign addresses to 4 departments with the following hosts 5, 16, 23 and 27 respectively. Perform the subnetting in such a way that the IP address wastage in each department are minimum. Also find out the subnet mask, network address, broadcast address and unassigned range in each department. [10]
 6. Why port number is used in networking? What are the services of transport layer? Differentiate between TCP and UDP protocol. [1+2+5]
 7. What is DNS? Explain the structure of DNS request and response with practical example. [2+6]
 8. What are the problems of IPv4? How IPv6 reduce these problems? Explain different strategies to transit from IPv4 and IPv6. [2+2+4]
 9. What is public key cryptography? Explain about RSA algorithm in detail. [2+6]
 10. Write short notes on: [4×2]
 - a) SSL
 - b) WEP

B.C.T
VII

34 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Networks (CT702)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What is computer network? Distinguish between OSI and TCP/IP reference model. [2+6]
2. What is transmission media? Explain about any three transmission media in detail. [2+6]
3. What are the major functions of data link layer? Explain about framing in detail. [3+5]
4. What is routing? Differentiate between link state routing and distance vector routing. [2+6]
5. Write short notes on: (any two) [4+4]
 - a) ARP
 - b) ICMP
 - c) IP
6. Distinguish between TCP and UDP. How is TCP connection established? Explain. [3+5]
7. SMTP is a text based protocol and uses 7 bit ascii. How can this be used to transmit sometimes like images? Explain. [8]
8. What are the drawbacks in IPV4? Which of these drawbacks do IPV6 solve? Explain. [2+6]
9. What is cryptography? Differentiate between symmetric key and public key cryptography. [2+6]
10. Write short notes on: (any two) [4×2]
 - a) WEP
 - b) IDS
 - c) SSL

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Networks (CT702)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What are the features of Client/Server Architecture? What are headers and trailers and how do they get added and removed? Explain. [4+4]
2. What do you mean by data switching? Explain about various types of switching with practical implementation example. [8]
3. What is the difference between Error Correcting and Error detection process? A bit string 0111101111101111110 needs to be transmitted at the data link layer what is string actually transmitted after bit stuffing, if flag patterns is 01111110. [5+3]
4. Explain the working principle of different types of network devices Repeater, HUB, Bridge, Switch and Router. [8]
5. How can you dedicate 10, 12, 8, 14 public IP addresses to department A, B, C and D respectively from the pool of class C with minimum losses of IP? Explain. [8]
6. Explain the UDP segment structure. Illustrate your answer with appropriate figures. [8]
7. What do you mean by email server? What are the protocols used on it? [2+6]
8. Explain the IPv6 datagram format with appropriate figures. [8]
9. Explain briefly how firewalls protect network and also explain different types of Firewall. Illustrate your answer with appropriate figures. [8]
10. What do you mean by Network security? Explain the operation of Data Encryption Standard Algorithm? [3+5]

Exam.	Old Back (2065 & Earlier Batch)		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Network (EG74ICT)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What do you mean by protocol and interfaces? Write the protocols used in each layer of ICP/IP model. [4+4]
2. How do you define network topology? Discuss the types of network topologies based on its size and geographical distributions. [3+5]
3. What are the functions of LLC and MAC sub-layer? Discuss different framing approaches used in data link layer. [2+2+6]
4. How data transfer occurs in Ethernet network? Explain. [6]
5. Discuss how CSMA works? Differentiate it with CSMA-CD. Explain the optical fiber cabling standards with examples. [2+2+4]
6. What is virus circuit switching? Describe the operation of Frame-Relay network. [2+6]
7. Differentiate between adaptive and non-adaptive routing. Explain shortest path finding algorithm in link state routing. [3+5]
8. Compare between leaky bucket and token bucket algorithm with the operation how token bucket works. [3+5]
9. What are the major problems with existing IPv4 network? Explain IPv4 addressing and sub-netting with example. [4+4]
10. Write short notes-on: [4+4]
 - a) ALOHA system
 - b) TCP header

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Network (CT702)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt *All* questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Explain the need of Networking Software in the form of Hierarchy? Mention in which level layer of OSI reference model following tasks are done. [6+2]
 - i) Timing and voltage of received signal
 - ii) Encryption and decryption of data
 - iii) Data framing
 - iv) Point-to-point connection of socket.
2. Define switching and multiplexing. Differentiate between circuit switching and packet switching. [4+4]
3. Explain different types of Data link layer framing mechanisms. [8]
4. What is the contribution of sub-netting in IP address management? Show the importance in this case. Baniya bank need to allocate 15 IPs in HR department, 30 in finance department, 24 in customer care unit and 25 in ATM machines. If you have one network of class C range public IP address. Describe how you will manage it. [8]
5. Why is routing protocol necessary? Explain the working process of Routing Information protocol (RIP) with example. [3+5]
6. Why do you think that there exist two protocols in transport layer where as there exists only one protocol in Internet layer in TCP/IP reference model. Explain token bucket algorithm for congestion control. [5+3]
7. What is HTTP protocol? With an example explain how a request initiated by a HTTP client is served by a HTTP server. [2+6]
8. Explain the IPv6 datagram format and the function of each field with necessary figure. [8]
9. Compare symmetric key encryption method with asymmetric key encryption. Describe the operation of RSA algorithm. [4+4]
10. What is network security? How can firewalls enhance network security? Explain how firewalls can protect a system. [2+2+4]

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Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Management (CT 701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. a) Define project. Discuss final year project characteristics of your own. How you compare SMART objective of your final year project? [1+3+3]
- b) What is PMBOK? Explain problem tree approach for solving project management issues. [2+2]
2. a) Describe PMI's framework for project management. List out common enablers of project success. [2+2]
- b) Distinguish product life cycle with project life cycle. [4]
3. a) - What is system view of project management? Explain about three sphere model of system management. [2+3]
- b) What is work breakdown structure (WBS)? How does it affect the work estimate of tasks/activities? [2+3]
4. a) What is project charter? How we calculate probability index for a project? [2+2]
- b) Distinguish project scope with product scope. What is the significance of scope verification in project scope management? [2+2]
5. For a particular project budgeted cost of work schedule was Rs. 9,50,000 and budgeted value of the work performed was Rs. 8,00,000 at a point of reporting date i.e at 20 weeks from starting date. But, the actual cost of work performed was 10,00,000 and the project completion time is 45 weeks. The project having estimated cost of Rs. 50,00,000. Based on above information, draw features of that project and comment on each parameter of earned value analysis. [6]
6. From the table below:

S.N	Activity	Duration (days)	Predecessor	Successor
1	A	5	-	B,C,D
2	B	3	A	E
3	C	2	A	F,H
4	D	3	A	G
5	E	2	B	H
6	F	1	C	I
7	G	3	D	I
8	H	1	C,E	-
9	I	2	F,G	-

- a) Draw the network diagram of activities involved in the project, show forward pass and backward pass calculation in Network of each node and indicates the critical path. [4+2+1]
- b) What is the total duration of project completion? [1]
- c) Calculate the total float, free float, Independent float and Interfering float for each activity. [4]

7. Quality is one of the most important factors to be controlled for effective delivery of project objectives. How quality assurance and quality control is implemented in order to deliver a successful project. [6]
8. Why reporting system is required in a project? Explain the hazards of communication error in a project. [2+2]
9. Why risk management is an essential part of project management? Describe the risk identification techniques in ICT project. [2+4]
10. a) What do you mean by project procurement management? Explain the different process adopted for procurement in ICT project. [1+4]
- b) What is balance scorecard? And why it is important in large organization? [1+1]
- c) What is project management maturity? [2]

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Management (CT 701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Explain about the Project and describe in detail about the characteristics of the Project. [2+3]
2. Describe the different skill sets required by a project manager and briefly explain each of them. [2+3]
3. Explain about the Project Management Institute (PMI) and describe the area of knowledge for the project manager to successfully completion of the Project. [2+3]
4. Describe the need work breakdown structure (WBS) and explain success criteria for projects. [2+3]
5. Describe with comparison between the project management and project portfolio management. [5]
6. Describe about the quality planning, quality assurance and quality control and explain different approaches to these processes. [5]
7. Construct the CPM network for a project with following activities: [15]

Activities	A	B	C	D	E	F	G	H
Predecessor	-	-	A	B	D, F	B	C	E, G
Durations (Days)	11	5	10	7	7	6	5	6

Find:

- a) Draw CPM Network Diagram
 - b) Critical path
 - c) Project completion time
 - d) EST, EFT, LST, LFT and Total float time
8. Describe the need of monitoring, evaluation and controlling process and explain its importance with suitable example of the local project. [2+3]
 9. Explain about the project procurement management and explain the types of processes adopted for procurement. [3+2]
 10. Describe about the project integration management and describe the inputs, tools and techniques used to develop the project charter. [2+3]
 11. Explain about the importance of effective communication in project management and describe its role for the successful project completion. [3+2]
 12. Write short notes on: [5×3]
 - a) Decision Tree analysis
 - b) Balance scorecard
 - c) Expert judgments
 - d) Contract (project) closure procedure
 - e) Project Risk Management

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Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Management (CT 701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Necessary tables are attached herewith.
- ✓ Assume suitable data if necessary.

1. a) What is PMBOK? How the external environmental influences on ICT project? [4]
- b) Define the project portfolio management and what are the key benefits of project portfolio management? [4]
- c) What is the role of Project Management and also explain the recommended skills for all project managers as well as ICT project managers. [4]
2. a) Describe the drivers for the project success and factor that slowing the project the project success in detail. [2+2]
- b) What are project quality requirement? How it helps in project quality management. Explain role of balanced scorecard in it. [3+3]
3. Define project risk and risk audits. Differentiate the qualitative risk analysis and quantitative risk analysis process. [3+3]
4. New software development project has the following different activities to be accomplished as listed on table. Answer the followings: [3×4]
 - (i) Prepare the activity network diagram.
 - (ii) Identify the critical tasks and calculate the total completion time.
 - (iii) If all the activities duration estimates are with variance of 2.25 weeks find out the probability of project completion within 30 weeks and 39 weeks.

Activity	Immediate Predecessor	Duration (in weeks)
A	-	2
B	-	4
C	-	6
D	A	8
E	B	10
F	B	8
G	C	12
H	D, E	12
I	G	4
J	F, H, I	7

5. Prepare a statement of work (SOW) and IS project which is to be developed as Engineering College MIS. You are free to make your own assumptions regarding the system. [8]

6. Compare the followings: [4×3]
- a) Developing project management plan versus monitoring and controlling of project.
 - b) Risk analysis using Decision tree technique versus Simulation technique.
 - c) Data analysis using Box plot versus Scatter plot.
 - d) Detail Project Report (DPR) document versus Request for Proposal (RFP) document.
7. a) What is system view of project management? Explain about three sphere model of system management. [2+2]
- b) Define Project Integration Management. And Also compare project scope with product scope. [2+2]
8. Write short notes on: [4×3]
- a) Effective meeting conduction process
 - b) PMI framework
 - c) Seller selection criteria
 - d) Tornado analysis

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Management (CT 701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. a) What are the triple constraints of Project? How is project different from operational work? [3+2]
- b) What are the essential interpersonal skill and managerial skill to be a successful Project Manager? [2+3]
2. Chuchche Consulting Company (3C) is considering a new project for a local hospital to be serviced and they are in planning phase. Answer the following as per the calculations from the different project activities timings of Table-A. [6+3+3]

Activity	Description	Duration (Weeks)	Preceding Activity
A	Select platform and COTS (Commercial of the shelf) software	3	-
B	Design for upgrading office network	3	A
C	Additional models design/ development	6	B
D	Model and structure database	4	B
E	Integrate hardware/components	4	C, D
F	System testing	5	E
G	System deployment	2	F
H	System tuning and hardening	4	F
I	Training material Finalization	3	F
J	Technical and end user Training	6	I

- a) Prepare activity network diagram.
- b) List the critical activities
- c) If the project is starting from Baishakh 1, 2076, Prepare a complete schedule of the project activities, including the exact project completion date.
3. a) What are the phases in project life cycle? How does project life cycle differ from product life cycle? [2+3]
- b) Why reporting system is required in a project? Explain the hazards of communication error in a project. [2+3]
4. What is EVM? Suppose you have a project to be completed in 12 months and the budget of the project is Rs 10 lac. Six months have passed and 6 lac has been spent, but on closer review you find that only 40% of the work has been completed so far. Find the SPI and CPI deduce whether the project is behind or ahead of schedule. [1+2+2+1]
5. Why risk management is important in project management? What are the quantitative risk analysis processes? Write a brief note. [3+4]
6. What is TQM? Are there quality standards for software industry and services? Relate with other types of standards too. [2+5]
7. Compare the followings: [4×4]
 - a) Project scoping vs. project closing
 - b) Formal vs. Informal communication
 - c) Sensitivity analysis vs SWOT analysis
 - d) Tender vs. quotation process
8. Write short notes: [3×4]
 - a) Balance scorecard framework
 - b) Future trend of ICT Project
 - c) Outsourcing and off-shoring options
 - d) ICT Code of Ethics

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Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
	Level	BE	Full Marks
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Management (CT 701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Necessary tables are attached herewith.
- ✓ Assume suitable data if necessary.

1. a) What is PMBOK? How the external environmental influences on ICT project? [2+3]
b) Define the project portfolio management and what are the key benefits of project portfolio management? [2+3]
2. Considering the following activity detail table having all the times in week answer the followings with calculation steps:

Activity	Optimistic Time	Most Likely Time	Pessimistic Time	Preceding Activity
A	3	6	9	-
B	6	12	24	-
C	6	9	18	A
D	3	6	21	B
E	9	12	21	D
F	3	6	18	C
G	6	12	24	E
H	9	18	27	F, G

- a) Draw the activity network diagram with identification of the critical path.
- b) Calculate the expected project completion time in weeks.
- c) What will be the probability for completion of the project within (i) 48 weeks and (ii) one year of the start date? [5+3+4]
3. What do you mean by project development life cycle? Explain describing various part, phase, stage and activities of the project development life cycle. [10]
4. Why the cost estimation for software project is a bit complex? Explain the EVM technique for the cost control and monitoring. Illustrate an EVA graph with your own values. [3+5+2]
5. Compare the followings: [4×4]
 - a) BOQ document vs. RFP document
 - b) Status reporting vs. progress reporting
 - c) Functional vs. matrix organization
 - d) Boxplot vs. histogram analysis
6. a) Discuss the basic approach used for Total Quality Management and how to improve Quality management in ICT project? [3+2]
b) Define project integration management and compare project scope with product scope. [2+3]
7. Write short notes: [3×4]
 - a) SWOT Analysis
 - b) Balanced Scorecard
 - c) Risk Register
 - d) Custom processes for IT Projects

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Management (CT701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. a) What do you mean by Project Development Lift Cycle? Explain various phases of the project development lift cycle. [5]
- b) What are the triple constraints of project? What makes a project different from operational work? [3+2]
2. a) What are the essential interpersonal and managerial skills to be a successful project manager? [2+3]
- b) "The Project Management Institute's Framework provides a basic structure for understand project management." Justify the statement. [5]
3. The clothing manufacturer, Neplai Luga, is considering introduction a line of cargo pants made entirely from hemp. The project costs NRs. 4.6 million and will generate cash flows of NRs. 1 million for 5 years. What is the payback period? If the interest rate is 0.3% per month, what is the project's NPV? Should the project be accepted? Why or why not? [10]
4. a) Consider the following project and answer the followings: [2.5×4]
 - i) Construct a network diagram
 - ii) Calculate the forward pass and backward pass
 - iii) Identify the critical path
- b) Calculate the total float on each activity.

Activities	Predecessor	Durations (Days)
A	-	11
B	-	15
C	A	5
D	A,B	10
E	B	5
F	C,D	2
G	E,F	7

5. a) A project manager is having trouble getting a project member to complete their tasks as assigned. What type of communication would the project manager want to use to address this problem initially and why? [5]
- b) What is PMBOK? And how the external environmental influences on ICT project? [2+3]

6. a) Why risk response planning is important in project? What are the response strategies for negative risk? [2+3]
- b) What is EVM? Suppose you are three month into a six month project. Assume that the budget burn rate is constant and the Budget at Completion (BAC) is Rs 1,20,000/- and Actual cost is Rs 65,000/- and Schedule Performance Index is 1.2. Find the CPI of the project and Estimate at Completion (EAC). Is the project is over budget or under budget? [1+2+1+1]
7. a) What do you mean by Project Procurement Management? Explain the different process adopted for procurement in ICT project? [1+4]
- b) How Pareto charts help to achieve better quality project? [5]
8. Write short notes on: [2.5×4]
- i) Balance Scorecard
 - ii) COCOMO for IT project
 - iii) Break-even Point
 - iv) Cause and effect diagram

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Management (CT701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. a) What is the project? Explain the triple constraints of project with figure and describe their relationship. [1+4]
 b) What are the managerial skills and essential soft skills to be a successful project manager? [2+3]
2. a) What are the key benefits of project portfolio management? Explain the characteristics of project life cycle with diagram. [2+3]
 b) Define PM context as per PMI. Explain the role and responsibility of key project member. [1+4]
3. a) What are the major causes of failure of the ICT project? Explain how organizational structures influence projects? [2+3]
 b) What is system view of project management? Explain about three sphere model of system management. [2+3]
4. Draw the network diagram and find the critical path using data below. Calculate the forward pass and backward pass and find the total float time. [2+2+2]

Activities	Predecessor	Durations (days)
START	-	0
A	START	5
B	A	6
C	START	4
D	C	5
E	B	7
F	E	3
END	D, F	0

5. What is EVM? The project has been planned that total estimated cost of project is Rs 5 Lakhs and there are 20 widgets to complete in 10 months duration. At 5th months, it reported that project was completed 40% and it has been spent Rs. 3 Lakhs only. Now calculate Cost Variance and Schedule Variance. Is the project is behind the schedule or ahead schedule? [1+2+2+1]
6. a) Define project integration management. What type of information should include while making the project charter? [2+3]
 b) Quality is one of the most important factors to be controlled for effective delivery of project objectives. How quality assurance and quality control are implemented in order to deliver a successful project? [5]

7. a) Why communication management is important in IT project? How to run the effective meeting in project? [3+2]
b) Risk management is an essential part of project management. Describe the risk identification techniques in IT project. [5]
8. a) What do you mean by Project Procurement Management? Explain the different process adopted for procurement in ICT project? [1+4]
b) Why reporting system and documentation are required in a project? Explain the hazard of communication errors in a project. [2+3]
9. Write short notes on: (Any two) [2×4]
a) Balanced scorecard
b) Contract closure procedure
c) Out sourcing and off-shoring options
d) ICT code of ethics

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Management (CT701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. a) What is the project? Explain the triple constraints of project with figure and describe their relationship. Differentiate between ICT project and other project. [1+2+1]
- b) What is the concept of project management? What are the different skill sets required by the project managers. Discuss some of the knowledge areas and techniques used during project management? [4]
2. a) How are project Portfolio management and Program management related to project management? Discuss. [4]
- b) What is PMBOK? What are the knowledge contents that falls under PMBOK? [4]
3. a) Describe briefly what happens in each of the five project management process groups (initiating, planning executing, monitoring and controlling and closing). [4]
- b) Briefly explain the different types project organisation structure. [4]
4. Draw the network diagram and trace the critical path using data below. Calculate the total project duration and total float time. [1+2+1+2]

Activities	Predecessor	Duration (Days)
A	-	3
B	A	4
C	A	2
D	B	5
E	C	1
F	C	2
G	D, E	4
H	F, G	3

5. Given the following information for a one-year project, answer the following questions. Recall that PV is the planned value, EV is the earned value, AC is the actual cost, and BAC is the budget at completion. [4×2]
- PV = \$23,000, EV = \$20,000, AC = \$25,000, BAC = \$120,000
- a) What is the cost variance, schedule variance, cost performance index (CPI), and schedule performance index (SPI) for the project?
 - b) How is the project doing? Is it ahead of schedule or behind schedule? Is it under budget or over budget?
 - c) Use the CPI to calculate the estimate at completion (EAC) for this project. Is the project performing better or worse than planned?
 - d) Use the schedule performance index (SPI) to estimate how long it will take to finish this project.

6. a) What is project scope management? Compare project scope with product scope. [4]
b) Discuss the concept of Quality Planning. What are different items related to Cost of Quality in terms of conformance cost and non conformance cost? [4]
c) What do you understand by statement of Work (SOW) in the context of project procurement management? Discuss the tentative content/structure of this document. [4]
7. Compare the following: [2.5×4]
a) Qualitative Vs Quantitative Risk Analysis
b) Outsourcing Vs Off-shoring options and criticalities
c) Project Charter document Vs Review meeting report
d) Quotation Vs Tender based procurement management
8. Suppose you are undertaking a major project required for completion of your bachelors of engineering. You are required to submit a project proposal to project coordinator office at your campus and in relation to your major project, [2.5×4]
a) Draw a WBS that details the entire activity during the project.
b) Plan activity duration of each activity in the form of PERT or Gantt diagram.
c) Make a table for cost estimation of each activity
d) Outline the communication management plan for the entire project.
9. Write short notes on: [4×2.5]
a) ICT Code of Ethics
b) Matrix Organisation
c) Balanced Scorecard
d) SWOT Analysis

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Management (CT701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. a) What is PMBOK? What are the knowledge contents that falls under PMBOK? [1+4]
 b) What are the key benefits of project portfolio management? Explain the characteristics of project life cycle with diagram. [2+3]
2. a) How can IT projects be classified? Write about the challenges of IT projects. [2+2]
 b) Explain the key elements of project proposal. [5]
3. Produce a critical path network diagram, showing the earliest start times and latest start times for each task, using the data in the table below. Calculate the total project time and total network slack time. [5+3+2]

Task code	Task name	Duration	Starts after completion of task(s)
PLAN	Plan project	3	
REQ	Capture requirements	8	PLAN
AGREE	Agree requirements with customer	2	REQ
DESIGN	Design system	10	AGREE
CODE	Code system	12	DESIGN
ID	Identify subcontractors	3	DESIGN
BUY	Buy-in subcontractor code	5	ID
INTEG	Integrate code and buy-in code	6	CODE, BUY
TRAIN	Train staff	5	DESIGN
REL	Release system	4	INTEG, TRAIN

4. a) What are the key features in change control on IT projects? Explain about input, tools and techniques and output of integrated change control. [3+3]
 b) What is project scope management? And compare Project scope with product Scope. [2+2]
5. Risk Management is an essential part of project management. Describe three typical risks that can occur in a software project and for each of these risks suggest two possible countermeasures. [8]
6. What is earned value analysis? A project is scheduled for the time of 12 months. The estimated cost of project is \$400000. After 3 months, evaluation is done and it is identified that 40% of work is accomplished but \$200000 cost has been incurred. Now calculate cost and schedule variance for the project. [2+6]

7. What are tools and techniques for Total Quality Management? And write possible steps to improve quality IT project. [4+3]
8. Compare the following: [3×3]
- i) Traceability vs. Adaptability in reviewing steps
 - ii) Horizontal vs. vertical communication and their degree of formalness
 - iii) Control charts vs. Cause and effect charts for quality assessment
9. Write short notes on: [3×3]
- i) Balanced Scorecard
 - ii) SWOT Analysis
 - iii) Contract Closure Procedure

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Management (CT701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. a) What is project? Explain the triple constraints of project with figure. [2+3]
 b) What are the essential interpersonal and managerial skills to be a successful project manager? [5]
2. What are the major causes of failure of the ICT project? Describe what bodies of knowledge are required by a PM to contribute for a successful project implementation. [3+4]
3. Consider the below table as the different WBS related job (activity) and sequences as per the project plan for a MIS building project. Times listed are in weeks and the activity network proceeds from 1st node to 10th node following the table sequences. Draw the critical path network diagram and calculate the total project time and total network slack time of this project. [5+3+3]

Job (activity)	Initial node	Final node	Estimated time
A	1	2	2
B	1	3	2
C	1	4	3
D	2	5	3
E	2	9	2
F	3	5	2
G	3	6	2
H	3	7	3
I	4	7	6
J	4	8	2
K	5	6	3
L	6	9	3
M	7	9	5
N	8	9	3
O	9	10	2

DeMarco states that "you cannot control what you cannot measure". Considering from software project manager's perspective, justify with relevant example?

4. A project manager can modify three basic elements of a software project: the resources available, the time available and the amount of product to be built. Describe how each of these three can be varied during a development process in order to ensure the resulting software is of high quality. [6]
5. Explain about the integrated change control in detail. [6]
6. Suppose you are managing a software development project. The project is expected to be completed in 8 months at a cost of Rs.50,000/- per month. After 2 months, you realize that the project is 30 percent completed at a cost of Rs 200,000/-. Determine whether the project is on-time and on-budget after 2 months. Calculate Cost and Schedule Performance Index. [8]
7. What is difference between communication skills and communication management? How does the communication skill help to resolve conflicts in ICT project? Explain with example. [2+4]
8. Quality is one of the most important factors to be controlled for effective delivery of project objectives. How quality assurance and quality control are implemented in order to deliver a successful project? Describe. [8]
9. Compare the followings: [3×3]
- i) Decision Tree vs. Tornado Analysis for risk management
 - ii) Quotation based purchase vs. Tender based purchase for procurement process
 - iii) Consistency vs. completeness in requirements engineering
10. Write short notes on: [3×3]
- i) Balanced scorecard framework
 - ii) Project management maturity model
 - iii) Responsibility assignment matrix

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Management (CT701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. a) Explain the triple constraints of Project with figure and describe their relationship? [2+2]
b) What are the essential interpersonal and managerial skill to be a successful project manager? [5]
2. a) Explain the Project Management Institute's (PMI) framework. [4]
b) What is PMBOK? What are the knowledge contents that falls under PMBOK? [1+4]
c) Explain various types of matrix organization. [4]
3. Compare project management with project portfolio management. Explain the characteristics of simple generic life cycle with necessary diagrams. [1+4]
4. What is Earned Value Management (EVM)? Derive the formulas that are used in schedule and cost performance, explain their significances. [1+3+3]
5. A big software project is under consideration for development. Overall 10 different activities as WBS are identified as listed below table with their timings in number of weeks.

Activities	a	m	b
(1,2)	7	11	13
(2,3)	1	4	7
(2,4)	10	15	48
(3,5)	12	20	26
(3,6)	4	7	16
(3,7)	4	7	16
(6,7)	5	8	11
(4,7)	2	8	14
(7,8)	9	12	15
(8,9)	1	4	7

Where

- a = Optimistic time
- b = Pessimistic time
- m = most likely time

- Calculate the following:
- a) What is the expected time of completion of the project? [3]
 - b) What is the probability of completing the project in 34 weeks? [3]
 - c) What is the probability of the activity 7 being completed in the twentieth week? [3]
6. Explain different types of Risk and illustrate the Risk management model with block diagram according to PMI; Project Risk Management process. [7]
 7. Define project integration management. Explain the necessary inputs, tools and techniques and outputs to develop a project charter. [1+4]
 8. Does effective communication management skill reduce the associated risk of an IT project? Explain with example. [4]
 9. What makes the project procurement process of very crucial component in project management? What are typical issues to be considered in e-bidding as a procurement processing tool? [2+4]
 10. Write short notes on: [3×5]
 - a) COCOMO (constructive cost model) for IT project
 - b) Contract closure procedure
 - c) Balanced scorecard framework
 - d) Pare to analysis
 - e) Quality Audit Plan.

Exam.	Regular		
	Level	BE	Full Marks
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Management (CT701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. a) Briefly explain the traits of being an effective and ineffective project manager? [2+2]
b) Explain the necessity of IT Project Management? How do you perform feasibility study in IT project? [2+2]
2. a) Explain about knowledge areas of PMI framework. [4]
b) Describe project management? Explain the roles and responsibilities of key project members. [2+2]
3. What is a project charter? How do you develop a project charter, explain the inputs and tools and techniques to develop it. [2+5]
4. A project work consists of the following activities as listed below in table. [9]

Activity	Description	Duration in days
A (1-2)	Start earth work	3
B (1-4)	Vendor selection	2
C (1-7)	Start handling	1
D (2-3)	Continue earth work	3
E (3-6)	Finish earth work	2
F (4-5)	Ordering raw material	4
G (4-8)	Excavation for drains	6
H (5-6)	Receiving raw material	5
I (6-9)	Base concreting	4
J (7-8)	Continue handling	4
K (8-9)	Laying drains	5

Draw the network diagram and trace the critical path of the network. What are the various timings and the total duration of the above project?

5. What do you mean by Project Procurement management and what are the different processes adopted for procurement? [5]
6. Explain various tools and techniques for performance reporting. [5]
7. If earned value is twice its actual cost for a project, calculate its cost performance index and cost variance percentage. Is the project over/under budget? [6]
8. a) Is there always a tradeoff between quality and productivity? Explain with an IT related example. [3]
b) What are the possible steps to improve project quality? [4]
9. What are the essential components of project scope management? Explain. [5]
10. Write short notes on: [5×4]
 - a) Sensitivity analysis
 - b) The Balanced Scorecard
 - c) Six sigma
 - d) Project Management Maturity
 - e) Decision tree analysis

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Management (CT701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. a) List out the characteristics of a project. Explain the role of effective feasibility study for the successful completion of a project. [2+2]
- b) What is the role of project manager? What are suggested skills for all project managers and for information technology project managers? [5]
2. a) What is project management institute (PMI)? How is it related to project management? Discuss PMI framework in relation with project management. [4]
- b) Explain with example the concept of drivers of project success and inhibitors of project success. [2+3]
3. a) Discuss the concept of project management process groups (PGs). How is it related to project management knowledge area? Give the example of two processes with necessary inputs, tools and techniques and outputs. [4]
- b) Define work break down structure and its importance in project management. What are different ways/approaches to prepare a work breakdown structure for a project? [5]
4. a) What do you understand by Quality planning, Quality Assurance and Quality Control? Explain different approaches to these processes. [4]
- b) Why better communication management is critical for projects? Discuss the communication management plan that should be considered for ICT projects. [5]
5. a) Explain the integrated change control process in depth. [4]
- b) Define WBS technique in scope management. [3]
6. Being an IT project manager how are you going to manage an IT based project that demands regular updates with new trends in market. [5]
7. Consider you are hired as a consultant in a IT college where every year 50 students are admitted in 4 year program. You are asked to prepare a tender. Specification document for setting up a digital library to be set-up on that college. State your all assumptions that you will be making while preparing the document. [6]
8. If schedule performance index (SPI) is 0.75 in a mega project undergoing near Devikapur district with earned value of being 60. Now calculate the planned value and also state whether the project is ahead schedule or behind schedule. [6]
9. Write short notes on: (any five) [4×5]
 - a) Balanced Scorecard
 - b) Tornado analysis
 - c) Critical path analysis
 - d) Decision tree analysis
 - e) Trends in cloud computing
 - f) Outsourcing and off-shoring options

Exam.	New Batch 2066 & Later Batches		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Management (CT701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What is a project? List out its characteristics. [2+2]
2. What are different skill sets required by a project manager? Briefly explain each of them. [5]
3. Define project management body knowledge. [2]
4. Explain about Project Management Institute Framework. [4]
5. What are the phases in project life cycle? How does a project life cycle differ from a product life cycle? [5]
6. Explain a Matrix Organization Structure with its advantages and disadvantages. [4]
7. Discuss the concept of project management process groups (PGs). List down two processes of project management process group with their inputs, tools and techniques and output. [4]
8. Explain about Integrated Change Control in IT project development. [5]
9. Why is it important to determine activity sequencing on projects? What are different diagrams/methods that can be used to sequence activities in the project? [5]
10. Given the following information for one-year project, use Earned Value Management (EVM) method to calculate, cost variance, schedule variance, cost performance index (CPI) and Schedule performance index (SPI) for the project. [6]
 - Planned Value = NPR 23,000
 - Earned Value = NPR 20,000
 - Actual Cost = NPR 25,000
 - Budget at Completion = NPR 1,20,000
11. What is a Maturity Model for software development? Explain them. [5]
12. Explain about the necessity of information distribution and its tools and techniques. [5]
13. What are different tools and techniques for risk identification? Discuss brainstorming and Delphi Technique for risk management. [4]
14. What is a procurement process? How is it performed in a project? [1+4]
15. Discuss about IT project management methodology. [5]
16. Write short note on: [2×6]
 - a) Project stakeholders
 - b) Project management information system
 - c) Critical Chain Scheduling
 - d) Categories of Risk
 - e) Balanced Score Card
 - f) Constructive Cost Model (COCOMO)

TRIBHUVAN UNIVERSITY
 INSTITUTE OF ENGINEERING
Examination Control Division
 2079 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BEL, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization and Management (ME 708)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Explain the historical development of the organization. Distinguish between formal and informal organizations. [3+5]
2. Are Fayol's principles of management applicable in today's organization? How? [8]
3. What do you mean by co-operative societies and describe different types of co-operatives. [8]
4. Explain the advantages of line and staff organization over line and function organization and describe the committee and its types. [4+4]
5. Explain the policies of personnel management. How can you identify the training needs of manpower in an organization? [5+3]
6. Explain the following: [4×2]
 - a) Job analysis
 - b) Job evaluation
 - c) Merit rating
 - d) Recruitment
7. Describe about the motivational theory and explain about the Herzberg's hygiene maintenance theory. [4+4]
8. Explain about the entrepreneurship and describe the steps for establishing a small scale unit of entrepreneurship. [4+4]
9. What is case study? Explain the steps involves in case study. [8]
10. Write short notes on: (Any Two) [2×4]
 - a) Organization Structure
 - b) Marketing
 - c) Entrepreneurial characteristics

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization and Management (ME 708)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Define organization as a system. Describe the concepts of organization in this respect. Is it possible to have an informal organization within the same family? [2+2+4]
2. Describe any two principal functions of a manager. Why do you think that these two functions are most important functions in an organization? What is the difference between organization and management? [4+2+2]
3. What is difference between Administrative Management Approach and Behavioral Management Approach? What is the rationale for Scientific Management Approach? [4+4]
4. Why joint stock company is better than partnership firm? Discuss the process of a private company registration in Nepal, including the types of documents required. [3+5]
5. How important is marketing in business? What are the different methods of purchasing? [4+4]
6. How would HR Manager tackle with the problem of talent poaching in the modern industries? Elaborate how HR manager would implement employee development program with short term plans. [4+4]
7. Define Intrinsic Motivation. Explain McGregor's Theory X and Theory Y of Motivation. [2+6]
8. Explain Blake's and Moun-ton's managerial grid. Describe different leadership approach. [4+4]
9. Why do we need MIS in addition to various softwares for specific tasks in an organization? What is the significance of Executive Information System (EIS) for top level managers? [4+4]
10. Entrepreneurship is not only the creativity of entrepreneur but also strongly need the conducive environment for entrepreneurship. Elaborate with your own logic. [8]

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

Exam.	Regular		
Level	BE		Full Marks 80
Programme	BEL, BCT	BEX	Pass Marks 32
Year / Part	IV / I		Time 3 hrs.

Subject: - Organization and Management (ME 708)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. Define organization. "Management is both a science and an art". Discuss this statement, giving suitable examples. What are the managerial skill a modern manager needs to be equipped with? [1+3+4]
2. What are the functions of Management? Explain different levels of management. What are the qualities of good manager? [3+2+3]
3. What advantage does behavioral management theory has over scientific management theory? Explain in brief. [8]
4. Define advertising and importance of marketing. Explain the Principle of purchasing. [1+3+4]
5. While ascending up the Maslow's pyramid some people fall from the grace (ie. they end up in cases like fraud, crime, rape, suicide, murder, jail terms, etc.) Describe this irony form your own perspective. [8]
6. Define term wages and merit ranking. Differentiate between recruitment and selection. Explain the scientific selection of manpower and methods of job analysis. [2+3+3]
7. Define Manpower Planning. Why is it important to discuss Personnel Policy with the employees at Hiring? [3+5]
8. Explain briefly about comparison of Alderfer and Herzberg's Theories. Explain the Vroom's expectancy of motivation theory. [3+5]
9. Define the term leadership. Which leadership style is appropriate in the modern engineering project. Explain in brief. [3+5]
10. Describe how data and information are used in an officer. What is the difference between Decision Support System (DSS) and Management Information System (MIS)? [4+4]

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization & Management (ME 708)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. Explain the importance of organization in the society. Define the term informal Organization. [5+3]
2. Explain behavioral management approach theory. What are the basic skills and function required for management? [3+5]
3. What advantages does joint stock organization has over partnership organization? Explain the features of line organization. [4+4]
4. Explain the role of purchasing and marketing department in the organization. [8]
5. Explain the role of personnel management in the organization. Why do we need manpower planning in the organization. [4+4]
6. What do you mean by incentives. Explain the different factors affecting the wage/salary structure. [4+4]
7. Define the term motivation and explain different technique of motivation. [4+4]
8. Describe Trait Approach of Leadership. Explain the Vroom's Expectancy theory of motivation. [4+4]
9. What are the qualities of a good leader? Explain the term entrepreneurship. [5+3]
10. Define the term MIS. Explain the value of MIS in the planning process. [3+5]

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization and Management (ME 708)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Define organization and management. What are the principles of organization? [2+6]
2. Describe various roles for a manager to play in an organization. Briefly mention the different models of management. [4+4]
3. What advantages does Joint stock Organization has over Partnership Organization? Explain the features of line Organization. [4+4]
4. Draw an outline of purchasing process for an organization. What are the challenges for marketing of software products in Nepal? [4+4]
5. Explain the role of Personnel Management in the organization. Why do we need manpower planning in the organization? [4+4]
6. How do you see the significance of Blake and Mouton's managerial grid for organization's growth? Explain. [8]
7. Define Motivation. Explain the features of Maslow's hierarchy of needs. [3+5]
8. Describe the role of entrepreneurship in the development of IT sector in Nepal. What are the risks and challenges for an aspiring entrepreneur in Nepalese IT sector? [5+3]
9. What is the relationship between computers and management information system? Explain how information systems can be organized in proper way? [2+6]
10. Define the term MIS. Explain the value of MIS in the planning process. [3+5]

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization and Management (ME708)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. Define organization. What are the roles of an organization for professional growth and development of an employee? Do we need informal organization indeed? [2+4+2]
2. What are the function of Management? Briefly explain the features of scientific management theory. [4+4]
3. What is the significance of Human Resource Manager in modern organization? Elaborate how HR manager would implement Scientific Management Approach? [4+4]
4. Define the term Marketing. Explain the importance of Marketing in an Organization. [3+5]
5. What are the functions of personal management? How wages are calculated? [5+3]
6. What kind of salary and benefits do you expect when you join an organization? Explain interviewing process. [5+3]
7. What do you mean by motivation? Why is the theory proposed by Maslow on hierarchy of human needs called satisfaction progression process? Explain with examples. [3+5]
8. What is the difference between a leader and manager? How do you want to pursue your career in future? What are the challenges for a good leader in modern times? [4+2+2]
9. Describe Democratic Leadership style. Explain Behavioral approach of leadership. [4+4]
10. Write short notes on: (Any two) [4+4]
 - a) Manpower planning
 - b) Organizational structure
 - c) Satisfaction progression Vs Frustration Regression Process

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization and Management (ME708)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Define organization. Why do we need organization? Can we sustain without organization? [2+3+3]
2. What are the functions of management? Explain different levels of management? What are the qualities of good manager? [3+2+3]
3. What is difference between Administrative Management Approach and Behavioral Management Approach? What is the rationale for Scientific Management Approach? [4+4]
4. Discuss on different steps for formation of Joint Stock Company. Explain the merits and demerits of Committee organization. [4+4]
5. What is personnel management? What must a good personal policy include?
6. Differentiate between attitude, group and executive motivation. List the techniques of motivation. [8]
7. Explain Blake's and Mouton's managerial grid? Describe different leadership approach? [8]
8. What is entrepreneurship? Why is there need for promotion of entrepreneurship in developing nation? [8]
9. Describe how you envision yourself as a leader in the future professional career. What are the qualities of a good leader? [4+4]
10. Describe how data and information are used in an officer. What is the difference between Decision Support System (DSS) and Management Information System (MIS)? [4+4]

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization and Management (ME708)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. Define Formal and Informal organization. Discuss on principles of organization. [2+6]
2. Why is there a need for different levels of management? What are the managerial skill a modern manager needs to be equipped with? [4+4]
3. What are advantages of line and staff organization over line organization and functional organization? Explain committee organization and its types. [4+4]
4. Suppose you are chief executive officer (CEO) of a software company. Which type of ownership would you prefer? And why? Suggest suitable organizational structure for it with figure. [4+4]
5. What is the importance of Personnel Policy in an organization? Discuss pros and cons of referral approach for manpower recruitment this competitive world. [4+4]
6. Explain how Vroom insists on importance of reward through his VIE theory for motivation. [8]
7. What do you mean by human need? How is need used for motivation? Explain the Herzberg's hygiene theory of motivation. [2+2+4]
8. Describe why you would / or would not undertake a startup after graduation. What are the risks and challenges for an aspiring entrepreneur in Nepal society? [5+3]
9. Having spent more than 3 years in a particular college/campus of yours, what are the recommendations you wish to propose to the college management for the future improvement that would it turn boost up overall academic performance and image of the college? [8]
10. Briefly describe about the information support required in different functional areas of management. [8]

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization and Management (ME708)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Define the term organization. What impact do different organizations have over our society? [3+5]
2. Which Management theory is best suited for the organizations in Nepal? [8]
3. Explain the features of Partnership Organization. What difficulties can a Partnership Organization possibly face? [3+5]
4. How important is Marketing in business? What are the different methods of Purchasing? [4+4]
5. Define Personnel Management. How important is discussing Personnel Policy/Employee Handbook to newly hired employee? [3+5]
6. What do you mean by incentives? Explain the different factors affecting the wage/salary structure. [3+5]
7. Define the term Motivation and explain Maslow's theory of motivation. [3+5]
8. Define the term leadership. Which leadership style is appropriate in the engineering project? Comment. [3+5]
9. Define the term Entrepreneurship. Explain entrepreneurship characteristic. [3+5]
10. Define the term MIS. What do you mean by website? Explain the role of computer for management information system. [2+2+4]

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization and Management (ME708)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Describe the role of organizations for human civilizations? What are the characteristics of an organization for business operations? [4+4]
2. State and define various levels of management. What are the various skills necessary to be an efficient manager? [4+4]
3. Which type of organizational structure is best suited for a temporary engineering project? Present your logic. [8]
4. Define the term marketing and why marketing is important in an organization? [8]
5. What is the role of interview in manpower hiring process? What is difference between wage and salary? What is an incentive and why is it needed? [3+3+2]
6. What do you understand by the term Motivation? Explain Herzberg's Hygiene Maintenance Theory. [3+5]
7. What is Leadership? In your opinion, which type of leadership is most efficient in Nepal? Present your views and logic. [3+5]
8. What is the importance of entrepreneurship for national economy in Nepali context? What is the significance of law enforcement for entrepreneurship? [4+4]
9. Differentiate between a Boss and Leader in terms of various Leadership styles you have studied. [8]
10. What are the Objectives of Case study? Explain the needs, function and importance of MIS in organizations of today's modern world. [4+4]

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization and Management (ME708)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
 - ✓ Attempt All questions.
 - ✓ The figures in the margin indicate Full Marks.
 - ✓ Assume suitable data if necessary.
1. Explain the term organization. Explain the difference between Formal and Informal organization. [3+5]
 2. Define the term management and explain the function of management. [3+5]
 3. What advantage does Behavioral Management theory has over Scientific Management Theory. Explain in detail. [8]
 4. An organization may change its form of ownership. Explain this with some examples. [4+4]
 5. Explain the importance of marketing in modern business. Salesmanship is an important ingredient of marketing. Do you agree with this statement? [4+4]
 6. Why is personnel Policy necessary to be discussed? Discuss the importance of Manpower Planning. [5+3]
 7. What is difference between appropriate and inappropriate human resources? List out some idea to elaborate them concerning with "Human Resources Management". [8]
 8. Discuss the role of management in Motivation. Explain McGregor's theory X and theory Y. [3+5]
 9. Entrepreneurship is not only the creativity of entrepreneur but also strongly need the conducive environment for entrepreneurship. Elaborate with your logic. [8]
 10. Explain the importance of Management Information System (MIS). Explain information support for functional areas of Management. [4+4]

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization and Management (ME708)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Why do we need organizations? Describe the principles of an organization. [4+4]
2. State and explain the different levels of Management. What are the basic skills required for Management? [4+4]
3. What is the difference between Scientific Management and Management Science? How do Taylor's principles illustrate importance of Scientific Management for production processes? [3+5]
4. Which organization structure is more suitable to engineering project? Discuss with your logic. [8]
5. Explain the different methods of Purchasing. Why is advertising one of the best form of Marketing? [5+3]
6. What is the difference between recruitment and hiring? Why do we need incentives in an organization? [4+4]
7. What are the different factors that affect wage / salary structure? Explain different methods of Training Manpower. [4+4]
8. What is the difference between theory 'X' and theory 'Y'? Explain on the basis of different theory of motivation. [8]
9. Describe Autocratic Leadership Style. Explain the different characteristics of Entrepreneur. [3+5]
10. If you are asked to prepare the case study considering the planning horizon, leadership, motivation and human resource development for either Nepal Electricity Authority or Nepal Telecom to improve the existing performance of these institution. How do you prepare case study following its structure? [8]

12 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization and Management (ME708)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt ***All*** questions.
- ✓ ***All*** questions carry equal marks.
- ✓ Assume suitable data if necessary.

1. Define organization and explain the principle of organization.
2. What do you mean by management? Explain the function of management.
3. Explain Henry Fayol's 14th principle of management.
4. What do you mean by co-operative societies? Explain different types of co-operatives.
5. What do you mean by purchasing? Explain different function of purchasing department.
6. Define personal management and explain function of personal management.
7. What do you mean by incentive? Explain different factors of salary structure.
8. Define motivation and explain different technique of motivation.
9. Define leadership and explain different qualities of good leader.
10. How information system support for functional area of management.

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization and Management (ME 708)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Why is an organization necessary? Explain the principles of an organization. [4+4]
2. What are the differences between the terms organization and management? Why do you need scientific approach of management to an organization? [2+2+4]
3. What do you mean by organizational structure? How is it defined for a particular enterprise? Write advantages and disadvantage of line organization. [2+2+4]
4. What do you mean by purchasing and procurement? Explain the functions of marketing. [3+5]
5. Explain the motive behind personnel management? Describe various functions of personnel management. How does Human Resources Management System differ from personnel management? [2+4+2]
(1+1+2)
6. Define the term job analysis and explain scientific selections of manpower. [5+3]
7. What do you mean by Human need? How is a need used for motivation? Explain Herz Berg's Hygiene theory of motivation. [2+2+4]
8. A reader is leader. Elaborate it in terms of leadership styles. What are the differences between a leader and a manager? [5+3]
9. Define Management Information System (MIS). Describe briefly about different types of Information System and their support to managers in decision making. [5+3]
10. What are the objectives of a case-study? Explain the needs, functions and importance of MIS. [3+5]

12 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization and Management (ME708)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What are the principles of organization? Explain formal and informal organization. [4+4]
2. What are the managerial skills? Explain the importance of management. [4+4]
3. What are the forms of ownership? Explain advantages and disadvantages of single ownership organization. [4+4]
4. What do you understand by behavioral management approach? Explain administrative management approach. [4+4]
5. What are the methods of purchasing? Explain the various functions of marketing. [4+4]
6. What is personnel management? Explain recruitment and selection of staff. [3+5]
7. What do you mean by Training and Development of Human resources? Explain various incentives used in organization. [5+3]
8. What is motivation? Explain the difference between Maslow's Heirarchical need theory and Alderfer's ERG theory. [3+5]
9. Define the term Entrepreneurship and write the steps for establishing a small scale unit of Entrepreneurship. [3+5]
10. Write short notes on: (any two) [4×2]
 - i) Objective of Case Study
 - ii) Organization structure and
 - iii) Organizing Information systems

2070 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX,BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization and Management (ME708)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Describe why organization is considered as an open system. Explain the importance of organization. [4+4]
2. Name the different models of management. Explain any three of them in detail. [3+5]
3. State and describe H.Fayol's administrative management theory. [8]
4. What is meant by 'Joint Stock Company'? Describe the procedure for forming 'Joint Stock Company'. [3+5]
5. Define marketing, advertising. Explain the function of purchasing in detail. [3+5]
6. Define the term personnel management. Explain the function of personal management. [3+5]
7. Define merit rating. State and describe the various methods of merit rating. [2+6]
8. What do you mean by human needs? Describe A. Maslow's hierarchy of needs theory in detail. [3+5]
9. Define leadership and explain by Blakes and Mouton's Management Grid. [3+5]
10. Define Management Information System. Explain information support for functional areas of management. [2+6]

Exam.	New Back (2066) 1 st Year Batch		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization & Management (ME708)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt any Ten questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What are the principles of Organization? Explain the Informal Organization. (4+4)
2. Explain the importance of Management and discuss the different function of Management. (3+5)
3. Explain Administrative Management Theory. (8)
4. What do you mean by organization structure? Explain Line Organization. (4+4)
5. Define the term purchasing. Explain different function of Purchasing department. (3+5)
6. Define the term Personnel management and explain its functions. (8)
7. What do you mean by incentives? Explain the different factors affecting the wage/salary structure. (3+5)
8. Define the term Motivation and explain different technique of motivation. (3+5)
9. Define the term leadership and Explain the different qualities of good leader. (3+5)
- 10 a. Define the term Entrepreneurship. (3)
b. Explain the Vroom's Expectancy theory of Motivation. (5)
11. What do you mean by Case study? Explain the objective of case study. (4+4)
12. Define term MIS. How information support for functional areas of management? (3+5)

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 Examination Control Division
 2069 Chaitra

Exam.	Regulation		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization and management (ME708)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Define Organization. Explain the importance of Organization in society. [3+5]
2. Define the term Management and explain different levels of Management. [3+5]
3. What do you mean by Joint Stock Company? Explain the advantages and limitations of a Joint Stock Company. [2+6]
4. What do you mean by motivation? Describe Maslow's hierarchy of needs briefly. Can Maslow's theory explain tireless quest of Laxmi Prasad Devkota for excellent literary works? [2+3+3]
5. Explain the process of recruitment and selection of man power in an organization. What do you mean by outsourcing in this context? [6+2]
6. a) Explain different Techniques of Motivation. [4]
 b) Define term contingency approach of Leadership. [4]
7. Define the term Entrepreneurship and explain the characteristics of Entrepreneurship. [3+5]
8. Define Management Information System. Describe briefly various types of Management Information System. [2+6]
9. Silicon Valley is the best example of successful entrepreneurship. Elaborate with your thoughts. [8]
10. Write short notes on: (any two) [2×4]
 - a) Computer aided Advertising
 - b) Objectives of case study
 - c) Satisfaction progression Vs. Frustration Regression Process

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization and Management

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt any **Five** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. a) How can organization behavior be affected by management? Explain all the elements of an organization. [4+4]
 b) Define management. Explain contingency and system approach of management. [3+5]
2. a) How are Policy group and Executive groups different in an organization? Differentiates between marketing and purchasing. [4+4]
 b) What is organization structure? Differentiate between responsibility and authority. Explain functional organization with sketch. [2+3+3]
3. a) What is MIS? Why is hierarchy of information system necessary in an organization? Write in brief. [3+5]
 b) Justify that information system is vital for planning and control process in an organization. [8]
4. a) What is motivation? Write differences between Maslow's hierarchical need and Alderfer's ERG theory of motivation. [3+5]
 b) Why is leadership necessary in an organization? Explain various leadership styles. [3+5]
5. a) What do you understand by personnel management? Explain job description. [4+4]
 b) Explain recruitment and selection process in detail. [8]
6. Write short notes on: (any four) [4×4]
 - a) Scientific Management
 - b) Span of control
 - c) Needs for MIS
 - d) Management by objective
 - e) Collective bargaining

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization and Management

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt any Five questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What is meaning of organization? Explain organization behavior as a multidisciplinary field. Explain the Scientific Management theory. [4+4+8]
2. What do you understand by policy and executive groups in an organization? Explain functional organization. What is responsibility and authority? Explain matrix organization chart. [4+4+3+5]
3. Why is MIS necessary for management? Explain computer and MIS. What is information Architecture? Explain database information system. [4+4+3+5]
4. Explain the two factors theory of motivation. How can you determine the most effective leadership style? Define the term informal organization. [5+7+4]
5. Define the term personnel management. Explain the different factors of wage and salary structure. What are the methods of performance appraisals? [4+8+4]
6. Write short notes on: (Any Four) [4×4]
 - a) Leadership style
 - b) Information system for planning process
 - c) Marketing concept
 - d) Database information system
 - e) Incentive programs

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEX, BCT	Pass Marks	16
Year / Part	IV / I	Time	1½ hrs.

Subject: - Energy Environment and Society (EX 701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What do you understand by the term "Appropriate Technology"? Define briefly technology transfer. [3+2]
2. Describe the relation between "Human development Index and Energy Consumption". [5]
3. What is current situation of Hydropower development in Nepal? Draw schematic diagram of hydropower system and explain how electricity is generated in power house. [2+3]
4. Explain how sunlight can be converted into electrical energy. How this electrical energy can be used to power internet server in remote area? Explain with block diagram. [2+3]
5. Is nuclear energy is going to an ultimate source of future energy need in the world? What are its advantages and disadvantages? [6]
6. What do you mean by smart cerid? Can it be applied in Nepal? Differentiate between V 2 G and G 2 V. [6]
7. How can you generate hydrogen as a carrier of energy? What could be its advantages in case of Nepal? [4]
8. How can you establish relationship between renewable energy sources and climate change issues? Give two practical examples. [4]

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

Exam.	Back		
Level	BE	Full Marks	40
Programme	BEX, BCT	Pass Marks	16
Year / Part	IV / I	Time .	1 ½ hrs.

Subject: - Energy Environment and Society (EX 701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Define technology along with its characteristics. How technology can be transferred in a developing country? How can indigenious technology be merged with modern technology? [1+2+2]
2. Why and which source of energy is being widely used in Nepal? What is current condition of energy use in Nepal and what may be the best plan of energy development in Nepal. Draw Maslow's hierarchy of needs and explain according to importance of needs related to society. [1+2+3]
3. Draw P-N junction solar cell and explain how it works. Draw block diagram of solar panel system for house hold use and explain briefly how the power comes from solar panel to electric sockets of home. [2+3]
4. Why hydropower potential in Nepal is so big? What is current situation of hydropower development in Nepal? Write schematic diagram of hydro power system and explain how hydropower is generated in power house. [1+1+3]
5. What do you mean by fuel-cell and how does it work? How can you use these fuel cells to avoid green house gases emissions? Explain with examples. [2+1+2]
6. What is mean by emission hazard? What are the basic types of emission hazard and how can society be protected from emission hazard? [1+3+1]
7. Why energy storage is challenging in this modern era too? Explain how super-capacitors can be used for energy storage. Explain how it works with appropriate diagrams. [1+1+3]
8. Write short notes on: (Any Two) [2×2]
 - a) Production of electrical using wind turbines
 - b) Nuclear Energy and its future in the world
 - c) Clean Development Mechanism and Sustainability

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEX, BCT	Pass Marks	16
Year / Part	IV/I	Time	1½ hrs.

Subject: - Energy, Environmental and Society (EX-701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. What are the positive and negative impacts of modern technology on environment? How can it be transferred in developing countries? [3+1]
2. How you can slow down global warming? Explain with three examples. [2+3]
3. List down the sources of renewable energy in Nepal and describe the benefits of solar electricity. [2+3]
4. What are the common sources of bio-mass in Nepal? What are the common environmental impacts of hydropower plant in Nepal? [2+3]
5. What are the advantages and disadvantages of wind energy? How can you generate electricity using wind turbines? [2+3]
6. Draw a polymer membrane electrolyte (PEM) fuel cell naming main parts. What are the applications of PEM fuel cell? Why super capacitors are so important? [2+1+2]
7. What is clean development mechanism? How is it related to sustainable development in developing countries? [2+2]
8. Describe briefly about hybrid vehicle. What do you mean by smart grid? [2+2]
9. Write down a comparative note on energy demand and supply in the latest case of Nepal. Which source of energy used in Nepal is not environmentally friendly? [2+1]

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	40
Programme	BEX, BCT	Pass Marks	16
Year / Part	IV / I	Time	1 ½ hrs.

Subject: - Energy Environment and Society (EX 701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What do you understand by technology transfer? What are the opportunities and challenges for developing countries to adopt new technology? [2+2]
2. What are greenhouse gases? Write cause and impacts of global warming in context to Nepal. What are the factors affecting Human Development Index. [1+2+2]
3. Why biomass conversion is needed? Explain Thermo chemical Bioconversion process. Differentiate fuel cell and Battery. [2+3+3]
4. What is solar constant? Discuss the potential of solar PV and solar thermal power in context to Nepal. [2+4]
5. Discuss the type of turbines use for hydropower generation. Write basic difference between these turbines. [2+2]
6. What is hazard? Explain Battery, Emission and Nuclear hazard. [1+3]
7. Why energy storage is necessary? Describe forms of energy storage system. [2+3]
8. Write short note on: (Any two) [2+2]
 - a) Demand and Supply of energy in world
 - b) Hybrid Vehicles
 - c) Load Shedding vs load shifting method

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEX, BCT	Pass Marks	16
Year / Part	IV / I	Time	1½ hrs.

Subject: - Energy, Environment and Society (EX 701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. What are the key impacts of technology on society? Describe. [4]
2. Describe the relations between human development index and energy consumption. What types of energy sources are being used in Nepal? [2+2]
3. What are the ways to drive electric vehicles? What are the advantages of electrical vehicles specially in case of Nepal? How can electric vehicle deliver energy to grid? [2+3+3]
4. Explain how sunlight can be converted to electrical energy. How this electrical energy can be used to power internet server in remote area? Explain with block diagram. [4+2]
5. Explain how does solar based power system work to pump water? What are its limitations? [4+2]
6. How can you generate electrical energy from wind? Where can this energy be used? [3+1]
7. List down forms of energy storage and briefly describe about hybrid vehicle. [4]
8. What are the key hazardous elements of energy resources that impacts on environment. [4]

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
	Level	BE	Full Marks
Programme	BEX, BCT	Pass Marks	16
Year / Part	IV / I	Time	1 ½ hrs.

Subject: - Energy Environment and Society (EX 701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. What is appropriate technology? What are the difference between appropriate technology and indigenous technology? Explain with suitable example. [1+3]
2. What is the energy use trend in Nepal? How can you relate Energy with Maslow's hierarchy of needs in our Nepalese context? [3+2]
3. Explain working principle of hydropower. How hydropower has been categorized in Nepal? [3+3]
4. What is the total renewable energy development potential in Nepal? What are the challenges for the country to harvest maximum energy production from those resources? What energy policy and strategy should be taken up? [3+3+2]
5. Explain the working principle of Polymer membrane electrolyte fuel cell and solid oxide fuel cells. What are the positive attributes of geothermal energy? [4+1]
6. Discuss the potential effect of nuclear hazard with suitable example. How can a supercapacitor be used as energy storage device? [3+2]
7. What are the energy storage technologies? Why energy storage become challenge in 21st century? [2+2]
8. What is Clean Development Mechanism (CDM)? How CDM projects contribute to achieve the Sustainable Development Goals (SDGs)? [1+2]

Exam.	Back		
Level	BE	Full Marks	40
Programme	BEX, BCT	Pass Marks	16
Year / Part	IV / I	Time	1 ½ hrs.

Subject: - Energy Environment and Society (EX701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. What is Energy in the sense of technological development? Describe relation between energy, environment and society. [8]
2. Write briefly on energy trends, demand and supply of energy in content of Nepal? [8]
3. Describe about the suitability of use of solar energy as an alternative source of energy in the context of Nepal. [8]
4. How nuclear hazard is significant in today's technological advancement? Describe long term and short-term effects of nuclear hazard. [8]
5. Write short notes on: (any two) [2×4]
 - i) Climate change and its impacts in our country
 - ii) Geothermal energy as alternative energy source
 - iii) Hybrid vehicle

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEX, BCT	Pass Marks	16
Year / Part	IV / I	Time	1 ½ hrs.

Subject: - Energy Environment and Society (EX701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt any **Six** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. Describe the term technology with its importance and method of transfer technology in modern time. [2+4]
2. Draw Maslow's hierarchy of needs and explain according to importance of needs. Describe clean development mechanism and sustainability issues for overall development of country. [2+4]
3. Write solar radiation as source of energy with solar cell and solar plant function with appropriate diagrams. [2+4]
4. What are the availabilities wind energy sources? Explain wind turbines, wind parks and power control system of wind energy production. [2+4]
5. How the synthetic fuel from the biomass works? Explain about bio fuel cells. [2+4]
6. What are the basics of electrochemistry? Explain about hydrogen production and storage. [2+4]
7. Write short notes on: [2+2]
 - i) Battery hazard
 - ii) Smart grid

Exam.	Back		
Level	BE	Full Marks	40
Programme	BEX, BCT	Pass Marks	16
Year / Part	IV / I	Time	1 ½ hrs.

Subject: - Energy Environment and Society (EX701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. How can we say a micro-hydro project in a rural area in sustainable? [4]
2. How do you classify the water turbines? Differentiate between impulse and reaction turbines? [1+3]
3. How can you relate Energy with Maslow's hierarchy of needs in our Nepalese context? [3]
4. What is biogas? List any four major routes for the conversion of biomass to energy and other useful products. [1+3]
5. What are the latest technologies for the energy storage? Describe briefly about the complications of the storage. [2+3]
6. What will be the parameters to be consider while designing the solar Mini grid in the village. [3]
7. What is Hydrogen Fuel? Describe about advantages and disadvantages of Hydrogen Fuel. [1+3]
8. Describe the types of wind machines used today and what are the applications of Wind Energy in Nepalese context. [1+2]
9. What are the common pollutants for the emission hazard how can it affects of the health. [4]
10. Describe about the recent activities of Conference of the Parties (COP) in UNFCCC. [6]

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEX, BCT	Pass Marks	16
Year / Part	IV / I	Time	1 ½ hrs.

Subject: - Energy Environment and Society (EX701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Write your answers to the point asked in the question considering the time available to you. Do not write your answer in redundant and unnecessary detail.
- ✓ Assume suitable data if necessary.

1. Write down the importance of Technology Transfer [3]
2. "Global Warming is posing a global threat." Write down some impacts of global warming which alarms us as a global threat. Write down your ideas about the way forward to reduce this threat in the light of Kyoto Protocol or Paris Agreement [5]
3. Write the definition of Insolation, Solar Constant, and Air Mass [6]
4. "Hydrogen based energy could take a larger role in future energy system". Write down the potentials and challenges of the hydrogen based energy system. [4]
5. Write down a basic synopsis of use of Geothermal Energy. [4]
6. Explain the working of a solar cell. [4]
7. Write down the processes of achieving energy from diverse biomass sources. [3]
8. "The incident like Chernobyl and Fukusima accidents makes us cautious on the use of Nuclear Power". Explain with reference to the Nuclear hazard issue. [3]
9. "A smarter grid applies technologies, tools and techniques available now to bring knowledge to power knowledge capable of making the grid work far more efficient" Smart Grid". Write down your understanding of the Smart Grid. [4]
10. Write down your findings of the case study in this subject. [4]

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	40
Programme	BEX, BCT	Pass Marks	16
Year / Part	IV / I	Time	1 ½ hrs.

Subject: - Energy Environment and Society (EX701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
 - ✓ Attempt All questions.
 - ✓ All questions carry equal marks.
 - ✓ Assume suitable data if necessary.
1. What do you mean by appropriate technology? What are the elements for the sustainable development?
 2. What is biogas? List any four major routes for the conversion of biomass to energy and other useful products. How it reduces climate change effect?
 3. What are the energy storage technologies? Why energy storage become challenge in 21st century?
 4. What is hydrogen fuel? Describe about advantages and disadvantages of Hydrogen fuel. Also compare with solar energy.
 5. Describe the types of wind machines used today and what the applications of Wind Energy are in Nepalese context. Also write down its limitation.

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEX, BCT	Pass Marks	16
Year / Part	IV / I	Time	1 ½ hrs.

Subject: - Energy Environment and Society (EX701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ All questions carry equal marks.
- ✓ Assume suitable data if necessary.

1. What is Appropriate Technology? Also explain it in detail.
2. Explain and comment on the current Global and National Energy Scenario.
3. Write down the definition of Insolation, Solar Constant, Irradiance and Peak Sun.
4. What do you understand by wind energy? Write down the factors that determine the available wind energy in any area. Also write down its scope.
5. Write down the potentials and challenges of the hydropower based energy system.

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	40
Programme	BEX, BCT	Pass Marks	16
Year / Part	IV / I	Time	1 ½ hrs.

Subject: - Energy Environment and Society (EX701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What do you mean by Appropriate Technology? Which types of Technology would be appropriate in context of Nepal in transport sector? Explain. [8]
2. Describe the principle of solar cell (PV) technology and its applications. [8]
3. A potential site has the net head of 100 m with 200 lit/sec of flow, what will be the power deliver from such site if the constructed power house overall efficiency is 50%? Which types of turbines would be suitable for such plants / site and also write its features. [8]
4. What is biomass? List any four major routes for the conversion of biomass to energy and other useful products. [1+3]
5. Describe the basic construction of solid oxide fuel cells (SOFCs). [4]
6. What are the energy storage technologies? Why energy storage become challenge in 21st century. [2+2]
7. What is climate change? How can Renewable Energy Technologies can help mitigate climate change. [4]

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEX, BCT	Pass Marks	16
Year / Part	IV / I	Time	1½ hrs.

Subject: - Energy Environment and Society (EX701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What do you mean by appropriate technology? Describe the impact of technology on society. [4]
2. What is the trend of consumption of energy sources in the world? Describe the importance of renewable energy sources? [2.5+2.5]
3. Define E number. How biofuels differ from other sources of energy? [1+3]
4. List out different factors affecting the solar intensity and applications of solar energy. [2+2]
5. What are the minimum constructional requirements to develop a hydropower system? [4]
6. What are the environmental impacts of wind machine? [4]
7. What is fuel cell? How does a solid oxide fuel cell work? [4]
8. The wide spread use of batteries has created many environmental concerns. Describe this concept. [4]
9. Write briefly about the working principle of hybrid vehicles. Also discuss the environment impacts. [2+2]
10. How the energy crisis of our country Nepal can be avoided? Describe its potential solutions in short. [3]

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	40
Programme	BEX, BCT	Pass Marks	16
Year / Part	IV / I	Time	1½ hrs.

Subject: - Energy Environment and Society (EX701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What are the impacts of technology on society? How the appropriate technology helps in the sustainable development of the country? [2+3]
2. Describe the relation between "Human Development Index and Energy Consumption". [4]
3. How do you classify the water turbines? Differentiate between impulse and reaction turbines? [1+2]
4. What is biomass? Describe any thermo-chemical conversion process of biomass? [1.5+2.5]
5. Define beam, diffuse and global radiation and show the relation between them. [3]
6. What are the different economic and environmental advantages of wind and geothermal energy in Nepal? [4]
7. What is fuel cell? How hydrogen fuel cell functions? [3]
8. Explain somatic and genetic effects due to nuclear hazards in human beings. [3]
9. What are the types of batteries? Describe about smart grid system? [2+3]
10. Write short notes on: (any three) [2×3]
 - a) Solar Constant
 - b) Storage of hydrogen
 - c) Global warming
 - d) SO₂ emission and its impact

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEX, BCT	Pass Marks	16
Year / Part	IV / I	Time	1 ½ hrs.

Subject: - Energy Environment and Society (EX701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. Describe technology transfer and its importance to society and nation. [4]
2. Explain how development of any country depend upon its energy consumption rate? Explain HDI and compare HDI for Nepal with other developed country with example of energy consumption. [8]
3. Discuss the need of energy in each steps of Maslow's hierarchy of needs. [4]
4. What are the various biomass ^{conversion} ~~conservation~~ process? Explain the IV curve for solar photovoltaic cell with temperature variation. How can you have the wind mapping data? Explain in brief. [8]
5. Write about solar thermal energy and its application. [4]
6. What is Hydrogen Fuel? Describe about advantages and disadvantages of Hydrogen Fuel. [4]
7. Write short notes on: [4×2]
 - i) Hybrid vehicle
 - ii) Smart grid system

Exam.	Regulation	Full Marks	
Level	BE	40	
Programme	BEX, BCT	16	
Year / Part	IV / I	Time	1½ hrs.

Subject: - Energy, Environment and society (EX701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt *All* questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What is a technology transfer? What impact technology has in your life? [1.5+1.5]
2. What is a clean Development Mechanism (CDM). What are the potential areas of CDM in Nepal? [2+2]
3. What do you understand by solar constant, global irradiation and peak sun? [3]
4. What is geothermal energy? Write down its application. [1+2]
5. Write briefly about briquette and biogas as energy sources in the context of Nepal. [4]
6. What are fuel cells? Explain briefly its working. [4]
7. What are the potential hazard of batteries. How you think this hazard can be prevented? [2+1]
8. What are smart grid and super-capacitor? [2+2]
9. Very briefly give your experience of the case study which you performed. [2]
10. Define the following is not more than three sentences. [2×5]
 - a) Appropriate technology
 - b) HDI
 - c) Solar water heater
 - d) Hydrogen as fuel
 - e) Application of Geothermal Energy

Exam.	New Back 2066 & Late Batch		
Level	BE	Full Marks	40
Programme	BEX, BCT	Pass Marks	16
Year / Part	IV / I	Time	1½ hrs.

Subject: - Energy, Environment and Society (EX701)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt *All* questions.
- ✓ The figures in the margin indicate *Full Marks*.
- ✓ Assume suitable data if necessary.

1. What do you understand by the term "Appropriate Technology"? [3]
2. What are the conventional and non-conventional energy sources? [3]
3. Write in short about the working of a solar cell. [3]
4. What is a source of hydropower? How can you categorize the hydropower plants? [1+2]
5. What is the major factor determining the availability of wind power? What are the major components of wind turbine? [1+3]
6. What is biomass? Write example of any two different conversion of biomass into fuel. [2+2]
7. Write about battery along with the working principle of anyone type. [4]
8. Write briefly about the emission hazard and their impact. [4]
9. Write very briefly your experience on the case study you performed. [2]
10. Define the following briefly: [2×5]
 - a) Technology transfer
 - b) Certified Emission Reduction
 - c) Characteristics curve of solar cell
 - d) Solar dryer
 - e) Classification of hydropower plant

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEI, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Digital Signal Analysis And Processing (CT 704)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. Define energy and power signal. Determine whether the signal $x[n] = \cos\left[\frac{2\pi n}{5}\right] + \sin\left[\frac{\pi n}{3}\right]$ is periodic or non-periodic and if it is periodic, find its fundamental period. [2+2]
2. Find the output of LTI system having input signal $x[n] = \delta[n] + 2\delta[n-1] - \delta[n-3]$ and $h[n] = 2\delta[n+1] + 2\delta[n-1]$. [5]
3. Find inverses Z-transform of $X(z) = (2z^4 + 2z^3 - 3z + 2)/(z^2 - 1.5z - 1)$, ROC: $|z| < 0.5$, using partial fraction expansion method. [6]
4. Plot the pole-zero in z-plane and draw the magnitude response (not to the scale) of the equation of the system describe by difference equation:
 $y[n] - 0.35y[n-1] + 0.25y[n-2] = x[n] - 0.75x[n-1]$. [3+7]
5. Draw direct form I and Direct form II realization of the following system.
 $y[n] - 0.25y[n-2] + x[n] + 0.4x[n-1] + 0.5x[n-2]$ [2+2]
6. Given a 3-stage lattice filter for all zero polynomial with coefficients $K_1 = 1/4$, $K_2 = 1/2$ and $K_3 = 1/3$. Obtain the system function and FIR filter coefficients of this filter. [6]
7. Define Gibb's phenomenon. Design the FIR filter using Kaiser window technique for the specifications: [2+8]

$$0.899 \leq |H(e^{jw})| \leq 1 \quad \text{for } |w| \leq 0.2\pi$$

$$|H(e^{jw})| \leq 0.01 \quad \text{for } 0.4\pi \leq w \leq \pi$$
8. Discuss the Remez exchange algorithm for FIR filter design. [5]
9. Design a low pass discrete time Butterworth filter using bilinear transformation having following specifications: [11+4]

Passband frequency (W_p) = 0.25π radians
 Stopband frequency (W_s) = 0.55π radians
 Passband ripple (δ_p) = 0.11
 Stopband ripple (δ_s) = 0.21. Consider sampling frequency of 0.5 Hz.

Also, covert the obtained digital low pass filter to high pass filter with new pass band frequency, $W_p = 0.45\pi$ using digital domain transformation.
10. Why we need FFT? Find the 8-point DFT of the following sequence using radix-2 DITFFT algorithm. [2+6]
11. If $X_1(k)$ and $X_2(k)$ are DFT of sequence $x_1[n] = \{1, 0, 0, 1\}$ and $x_2[n] = \{2, 0, 2\}$ respectively then find the sequence $X_3[n]$; if DFT of $x_3[n]$ is given by $X_3(k) = X_1(k)X_2(k)$. [7]

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Digital Signal Analysis and Processing (CT 704)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Compare between energy signal and power signal. Determine whether the signal $x[n] = e^{j(\frac{\pi}{2}n + \frac{4\pi}{7})}$ is energy signal or power signal. [2+2]

2. Find the output of LTI system having impulse response $h[n] = \left(\frac{1}{2}\right)^n \{u[n+2] - u[n-2]\}$ to the input $x[n] = \{2, 1, 0, -1, 4\}$. [5]

3. Define z-transform for a discrete time signal. Find the inverse z-transform for $H(z) = \frac{z}{3z^2 - 4z + 1}$ using partial fraction method for $\frac{1}{3} < |z| < 1$. [1+5]

4. Plot the pole-zero in z-plane and draw magnitude response (not to the scale) of the system described by difference equation $y[n] - 0.3y[n-1] + 0.2y[n-2] = x[n] - 0.5x[n-1]$ [3+7]

5. Compute Lattice-ladder coefficients and draw lattice structure for given system $H(z) = (1 - 0.4z^{-1} + 0.25z^{-2}) / (1 - 0.3z^{-1} + 0.5z^{-2})$. Also check the stability of given system. [6+1]

6. Obtain the Direct Form I and Direct Form II realization of the following system: $y[n] - 0.75y[n-1] - 0.25y[n-2] = x[n] + 0.5x[n-1]$ [4]

7. Design a low pass digital FIR filter having Pass band edge frequency $\omega_p = 0.2\pi$, Stop band edge frequency $\omega_s = 0.45\pi$ and Stop band attenuation $\alpha_s = 51$ dB using any appropriate window function. [5+3]

8. What do you understand by optimum filter? Describe Remez exchange algorithm for FIR filter design along with the flowchart. [1+6]

9. Design a low pass digital IIR filter by Bilinear Transformation method to an approximate Butterworth low pass filter, if passband edge frequency is 0.24π radians and maximum deviation of 0.98 dB below 0 dB gain in the passband. The maximum gain of -14.95 dB and frequency is 0.57π radians in stopband, consider sampling frequency 0.5 Hz. Compare impulse invariance method with bilinear transformation method. [11+3]

10. Why we need DFT? Find 8-point DFT of sequence $x[n] = \{1, 2, 4, 3, 5, -1, 3\}$ using Decimation in Frequency Fast Fourier Transform (DIFFFT) algorithm. [2+6]

11. Find the circular convolution of the sequences $x_1[n] = \{1, -1, -2, 3, -1\}$ and $x_2[n] = \{1, 2, 3\}$. [7]

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Digital Signal Analysis and Processing (CT 704)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Determine whether the signal $x[n] = \cos\left[\frac{\pi n}{2}\right] \cdot \cos\left[\frac{\pi n}{4}\right]$ is periodic or non periodic and if it is periodic, find its fundamental period. [4]

2. Find the output of LTI system having impulse response $h[n] = u[n] - u[n-4]$ and input signal $x[n] = (1/2)^n u[n]$. [5]

3. Define ROC. Find inverse z-transform of $X(z) = (z^3 + z^2 + 1.5z + 0.5)/(z^3 + 1.5z^2 + 0.5z)$, ROC: $|z| < 1/2$. [1+5]

4. Determine the zero-input response for a second order system given by: [4]

$$y[n] - 3y[n-1] - 4y[n-2] = x[n]$$

5. Plot the pole-zero in z-plane and draw magnitude response (not to the scale) of the system described by difference equation. [2+4]

$$y[n] - 0.4 y[n-1] + 0.25 y[n-2] = x[n] - 0.4x[n-1]$$

6. The system function of a filter is $H(z) = 1 + \frac{13}{24}z^{-1} + \frac{5}{8}z^{-2} + \frac{1}{3}z^{-3}$. Draw the Direct Form and Lattice Structure implementation of the above filter. [3+7]

7. Design a linear phase FIR filter using KAISER window to meet the following specifications: [8]

$$\begin{cases} |H(e^{jw})| \leq 0.01; & 0 \leq w \leq 0.25\pi \\ 0.95 \leq |H(e^{jw})| \leq 1.05; & 0.35\pi \leq w \leq 0.6\pi \\ |H(e^{jw})| \leq 0.01; & 0.65\pi \leq w \leq \pi \end{cases}$$

8. What is optimum filter? Show mathematical expression of Remez exchange algorithm for FIR filter design. [1+6]

9. Design a LPF Butterworth filter using Impulse Invariance Method (IIM) method with passband and stopband frequencies 200Hz and 500Hz respectively. The passband and stopband attenuations are 5dB and 12dB respectively. The sampling frequency is 5000Hz. What is pre-warping and why it is necessary? Explain. [12+3]

10. Differentiate between DFT and DTFT. Find the circular convolution of $x_1[n] = \{2, 1, 2, 1\}$ and $x_2[n] = \{1, 2, 3, 4\}$ [2+6]

11. Find the 8-point DFT of $x[n] = u[n] - u[n-4]$ using FFT DIT algorithm. [7]

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Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Digital Signal Analysis and Processing (CT 704)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
 - ✓ Attempt All questions.
 - ✓ The figures in the margin indicate Full Marks.
 - ✓ Assume suitable data if necessary.
1. Define even and odd type discrete time signals with suitable example. Plot the signal $x[-2n+3]$ where $x[n] = \{1, 2, 0, -1, -3, -4\}$. [2+3]
 2. Determine whether the following system are: [5]
 - a) $y[n] = x[-n]$ is time-invariant or not.
 - b) $y[n] = x[n^2]$ is linear or not.
 3. Find the output of LTI system having input signal $x[n] = u[n+1]-u[n-4]$ and impulse response $h[n] = (1/2)^n u[n-1]$. [6]
 4. Define ROC of z-transform. Find inverse z-transform using partial fraction expansion of $X(z) = (z^4 + 5z^3 - 3z + 4) / (z^2 - 1.5z - 1)$, ROC: $|z| < 0.5$. [2+6]
 5. Draw the pole-zero in the z-plane for a system with poles at $0.45 \pm j1.06$ and zeroes at $0.58 \pm j2.06$. Also plot the magnitude response (not to the scale) of the system. [2+6]
 6. Compute Lattice and Ladder coefficients and Draw lattice-ladder structure for given IIR system $H(z) = (0.5 - 2z^{-1} + 3z^{-2}) / (1 - 0.5z^{-1} - 0.7z^{-2} + 0.3z^{-3})$. [6+4]
 7. Realize the given system in Cascade form of 2nd order section in signal flow graph representation. [4]

$$H(z) = \frac{\{(1 - 0.5z^{-1})(1 + 0.35z^{-1})(1 - 0.3e^{j2\pi/5}z^{-1})(1 - 0.3e^{-j2\pi/5}z^{-1})\}}{\{(1 - 0.6e^{j\pi/3}z^{-1})(1 - 0.6e^{-j\pi/3}z^{-1})(1 + 0.5e^{j2\pi/7}z^{-1})(1 + 0.5e^{-j2\pi/7}z^{-1})\}}$$
 8. Design the FIR filter using suitable window for the specifications: [6]

$$0.899 \leq |H(e^{j\omega})| \leq 1, \quad \text{for } |\omega| \leq 0.2\pi$$

$$|H(e^{j\omega})| \leq 0.01, \quad \text{for } 0.4\pi \leq \omega \leq \pi$$
 9. What is optimum filter? Show mathematical expression of Remez exchange algorithm for FIR filter design. [1+5]
 10. Design a digital low pass Butterworth filter by applying bilinear transformation techniques for the given specifications: [10]
 - Passband peak to peak ripple ≤ 1 dB
 - Passband edge frequency = 1.2KHz
 - Stopband Attenuation ≥ 40 dB
 - Stopband edge frequency = 2.5 KHz
 - Sample rate = 8KHz
 11. Find 8-point DFT of sequence $x[n] = \{1, 2, 3, 3, 5, 0, 4, 6\}$ using Decimation in frequency Fast Fourier Transform (DIFFFT) algorithm. [7]
 12. Find $x_3[n]$ if DFT of $x_3[n]$ is given by $X_3(k) = X_1(k) * X_2(k)$ where $X_1(k)$ and $X_2(k)$ are 4-point DFT of $x_1[n] = \{1, 2, -2\}$ and $x_2[n] = \{1, 2, 3, -1\}$ respectively. [5]

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Exam.	Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Digital Signal Analysis and Processing (CT 704)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Explain Fourier transform multiplication property for two sequences. Write Dirichlet's conditions for Fourier series. [4+3]
2. Find convolution between two signals $x[n] = 2^n 4^{-n}$, $0 < a < 1$ and $h[n] = 4[n]$ [6]
3. State Convolution property of Z-transform. Find inverse Z-transform of
 $X(z) = z / \{(z - 0.6)(z + 0.5)^2\}$, ROC: $|z| > 0.6$ [3+6]
4. Describe stability and causality characteristics of LTI system in terms of Impulse Response and ROC of its transfer function with suitable examples. [4+3]
5. Compute Lattice and Ladder coefficients and Draw lattice-ladder structure for given IIR system $H(z) = (0.7 - 1.5z^{-1} + 0.5z^{-2}) / (1 - 0.5z^{-1} - 0.7z^{-2} + 0.3z^{-3})$ [6+3]
6. For the system described by the following difference equation: [2+8]
 $y[n] = 0.67x[n] - 0.3x[n-1] + 2.75y[n-1]$

Map the poles and zero in the z-plane and plot the phase response of the system.

7. Design a low pass discrete IIR filter by Bilinear Transformation method to an approximate Butterworth filter having specifications as below: [12]
Pass bandedge frequency (ω_p) = 0.22π radians
Stop bandedge frequency (ω_s) = 0.54π radians
Passband ripple (δ_p) = 0.11
Stopband ripple (δ_s) = 0.22, Consider sampling frequency 0.5 Hz.
8. Why we need DFT? Find 8-point DFT of sequence $x[n] = \{1, 2, 3, 3, 5, 1, 4, 2\}$ using Decimation in frequency Fast Fourier Transform (DIFFFT) algorithm. [2+8]
9. In which case do we choose FIR filter and IIR filter? Design a Kaiser Window to meet the following specifications. [2+4+4]

$$0.99 \leq |H(e^{jw})| \leq 1.01, \quad \text{for } 0 \leq w \leq 0.16\pi$$

$$|H(e^{jw})| \leq 0.01, \quad \text{for } 0.18\pi \leq w \leq 2\pi$$

Draw the flow chart for Remez- Exchange algorithm

Exam.	Back		
	Level	BE	Full Marks
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Digital Signal Analysis and Processing (CT704)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Determine whether the following sequences are linear or not: [3+3]

a) $y[n] = x^2[n]$

b) $y[n] = \cos\left(\frac{5\pi}{8}n + \frac{\pi}{4}\right)$

2. Find the output of LTI system having impulse response $h[n] = 2^n * \{u[n] - u[n-3]\}$ and input signal $x[n] = \delta[n] + \delta[n-1] + \delta[n-2]$. [5]

3. List out the properties of Region of convergence and locate the ROC of the following signal. [3+6]

$$x[n] = (0.6)^n u[n] + (0.25)^n u[n]$$

4. Draw the poles and zeros in the z-plane for a system with poles at $0.45 \pm j1.06$ and zeros at $0.58 \pm j2.06$. Also plot the magnitude response of the system. [2+8]

5. Draw the Lattice structure from the following system function: [7+3]

$$\frac{1}{3 + \frac{39}{24}Z^{-1} + \frac{15}{8}Z^{-2} + \frac{3}{9}Z^{-3}}$$

And represent $\frac{5}{8}$ and $-\frac{5}{8}$ in sign magnitude, 1's complement and 2's complement format.

6. Design a digital low-pass filter with the following specification: [12]

- i) Pass-band magnitude constant to 0.7 dB below the frequency of 0.15π
- ii) Stop-band attenuation at least 14 dB for the frequencies between 0.6π to π

Use Butterworth approximation as a prototype and use bilinear transformation method to obtain the digital filter.

7. Design a linear phase FIR filter using Kaiser Window to meet the following specifications: [8+4]

$$0.99 \leq |H(e^{jw})| \leq 1.01, \quad \text{for } 0 \leq w \leq 0.19\pi$$

$$|H(e^{jw})| \leq 0.01, \quad \text{for } 0.21\pi \leq w \leq \pi$$

Draw the flow chart for Optimum filter design.

8. How fast is FFT compare to DFT? Draw the butterfly diagram of 8-point DFT of a sequence as $x[n] = n+1$ using Decimation in Time FFT algorithm. [3+7]

9. State the circular convolution property of DFT. Find the circular convolution of: [1+5]

$$x_1(n) = \{1, 2, -1, 1\} \text{ and } x_2(n) = \{1, 3, 5, 7\}$$

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Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Digital Signal Analysis and Processing (CT 704)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Define Power and Energy type discrete time signal with suitable example. Differentiate between Fourier Series and Fourier Transform. [3+4]

2. Find the output of LTI system having impulse response $h[n]$ with $h[-2] = 3$, $h[0] = 2$, $h[1] = 1$ and input signal $x[n] = (2)^n$, for $-1 \leq n \leq 3$. Also check the answer. [5+2]

3. Plot the pole-zero in z-plane and draw magnitude response (not to scale) of the system described by differential equation [2+7]

$$y(n) - 0.3y(n-1) = 2x(n-2) + 0.7x(n-1) + 4x(n)$$

4. Draw the lattice structure from the following system function [9]

$$H(z) = \frac{1}{1 + \frac{2}{3}z^{-1} + \frac{5}{8}z^{-2} + \frac{2}{3}z^{-3} + z^{-4}}$$

5. What is optimum filter? Show mathematical expression of Remez exchange algorithm for FIR filter design. [2+6]

6. List out the properties of Region of convergence and locate the ROC of the following signal [4+6]

$$x[n] = (0.1)^n u[n] + (0.3)^n u[-n-1]$$

7. Using bilinear transformation, design a digital filter using Butterworth approximation which satisfies the following conditions [10]

$$0.8 \leq |H(e^{jW})| \leq 1 \text{ for } 0 \leq W \leq 0.2\pi$$

$$|H(e^{jW})| \leq 0.2 \text{ for } 0.6\pi \leq W \leq \pi$$

8. How fast is FFT? Find $X(3)$ and $X(5)$ for given sequence $x[n] = \{1, -2, 3, 2\}$ using DITFFT algorithm. [2+8]

9. Differentiate between linear convolution and circular convolution compute circular convolution of signals [3+7]

$$X_1[n] = \{0, 0, 1, 1\} \text{ and } X_2[n] = \{1, 1, 1, 1\}$$

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Digital Signal Analysis and Processing (CT704)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Plot the sequence $x[n] = u[n] - u[n-3] + 5\delta[n-4] + nu[n-6]$. List out the properties of LTI system. [3+2]
2. Determine whether the following system are: [3+3]
 - a) $y[n] = y[n-4] + x[n-4]$ is Time-invariant or not
 - b) $y[n] = x^2[n]$ is Linear or Non-linear
3. Define a ROC. What are the properties of ROC of z-transform? Find the inverse Z-transform of $X(z) = (2z^2 + 2z + 3z + 5)/(z^2 - 0.1z - 0.2)$, ROC: $|z| < 0.4$. [1+3+5]
4. The poles of a system are located at: $0.45 - 0.77i$ and $-2 \pm 0.3i$. Map the poles and zero in the z-plane and plot the magnitude response of the system. [2+8]
5. Obtain the Direct Form I and Direct Form II realization of the following system. [5]

$$3y[n] + y[n-1] + 2y[n-4] = 2x[n] + x[n-3]$$
6. Determine the lattice coefficients corresponding to the FIR filter with the system function: [5]

$$H(z) = A_3(z) = 1 + \frac{52}{96}z^{-1} + \frac{25}{40}z^{-2} + \frac{1}{3}z^{-3}$$
7. Design a digital low-pass filter with the following specification: [12]
 - i) Pass-band magnitude constant to 0.7 dB below the frequency of 0.15π
 - ii) Stop-band attenuation at least 14 dB for the frequencies between 0.6π to π
 Use Butter worth approximation as a prototype and use impulse invariance method to obtain the digital filter.
8. Design a FIR linear phase filter using Kaiser window that meets the following specifications: [9+3]

$$|H(e^{jw})| \leq 0.01, 0 \leq |w| \leq 0.25\pi$$

$$0.95 \leq |H(e^{jw})| \leq 1.05, 0.35\pi \leq |w| \leq 0.6\pi$$

$$|H(e^{jw})| \leq 0.01, 0.65\pi \leq |w| \leq \pi$$
 Also determine the minimum length $(M+1)$ of the impulse response and Kaiser window parameter β .
9. Why do we need DFT? Draw the butterfly structure to compute the DFT of the following signal using Radix-2 DIFFFT algorithm, and compute $X(2)$ and $X(1)$ only [3+7]

$$x[n] = \{1.5, -1, 1.8, 0.6, 3, 1.7\}$$
10. Define zero padding. Find the linear convolution through circular convolution with padding of zeros for the following sequences: $x[n] = \{1, 1, 1, 1\}$ and $h[n] = \{2, 3\}$. [1+5]

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Digital Signal Analysis and Processing (CT704)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Define Energy and Power type discrete time signal. Check whether signal $x[n] = e^{j(\pi n/3 + \pi/4)}$ is periodic or not. If it is periodic, state its periodic time. [2+2]
2. Find the output of LTI system having impulse response $h[n] = (1/2)^n \{u[n+2] - u[n-2]\}$ and input signal $x[n] = \{2, 1, 0.5, -1\}$. Also check the answer. [3+2]
3. State and explain the properties of a Region of Convergence (ROC). Find the inverse z-transform of $X(z) = z^2 \left[1 - \frac{3}{2}z^{-1} \right] (1+z^{-1})(1-z^{-1})$ [3+3]
4. Plot the pole-zero in z-plane and Draw Magnitude Response (not to the scale) of the system described by difference equation $y[n] - 0.4y[n-1] + 0.2y[n-2] = x[n] + 0.5x[n-1] + 0.6x[n-2] + 0.8x[n-3]$ [3+7]
5. Draw the direct form and Lattice structure of a filter with system function $H(z) = 1 + 0.7z^{-1} + 1.2z^{-2} - z^{-3}$. [3+7]
6. Why Kaiser window is better than other fixed windows in FIR filter design? Find out first six coefficients of impulse response of a low pass FIR filter having Pass band edge frequency $\omega_p = 0.2\pi$, Stop band edge frequency $\omega_s = 0.5\pi$ and Stop band attenuation $\alpha_s = 41$ dB using any appropriate window function. [2+6]
7. What is an optimum filter? Show mathematical expression of the Remez exchange algorithm for FIR filter design with flow chart. [1+6]
8. Design a low pass discrete IIR filter by Bilinear Transformation method to an approximate Butterworth filter having specifications as below: [15]
 - Pass bandedge frequency (ω_p) = 0.27π radians
 - Stop bandedge frequency (ω_s) = 0.58π radians
 - Passband ripple (δ_p) = 0.11
 - Stopband ripple (δ_s) = 0.21, Consider sampling frequency 0.5 Hz.
9. Compute the 8-point DFT of the sequence $x[n] = \left\{ \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, 0, 0, 0, 0 \right\}$ using Decimation in Frequency Fast Fourier Transform (DIF-FFT) algorithm. [7]
10. What is a zero padding? If $X_1(k)$ and $X_2(k)$ are DFT of sequence $x_1[n] = \{1, 2, 0, 1, -2\}$ and $x_2[n] = \{1, 0, 1, 1, 2\}$ respectively then find the sequence $x_3[n]$; If DFT of $x_3[n]$ is given by $X_3(k) = X_1(k), X_2(k)$. [1+7]

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Digital Signal Analysis and Processing (CT704)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
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1. Define and plot a discrete time unit step signal. Explain its relation with unit impulse signal. [1+2]
2. Calculate $y[n]$, if $x[n]$ is $x[-2] = 0.5$, $x[0] = 1$, $x[1] = 0.75$, $x[3] = 0.5$ and $n[n]$ is $n[0] = 1$, $n[1] = 0.75$ and $n[2] = 0.5$ and verify your result. [6]
3. Define a ROC. Find inverse Z-transform of $X(z) = (2z^3 + 2z^2 + 3z + 5) / (z^2 - 0.1z - 0.2)$, ROC: $|z| < 0.4$ [1+5]
4. Define the difference equation with example. The Poles of a system are located at: $0.45 + 0.77i$ and $2 \pm 0.7i$ and zeros at: $1.2 \pm 0.43i$. Plot the magnitude response of this system. [2+8]
5. Draw the Lattice Structure from the following system function: [10]

$$\frac{1 + \frac{1}{3}z^{-1} + \frac{9}{8}z^{-2} + \frac{4}{3}z^{-3} + z^{-4}}{1 + \frac{2}{3}z^{-1} + \frac{5}{8}z^{-2} + \frac{2}{3}z^{-3} + z^{-4}}$$

6. Design a digital Butterworth low pass filter satisfying the constraints

$$\begin{cases} 0.707 \leq |H(e^{jw})| \leq 1 & 0 \leq w \leq \frac{\pi}{2} \\ |H(e^{jw})| \leq 0.2 & \frac{3\pi}{4} \leq w \leq \pi \end{cases}$$

With $T = 1$ sec using bilinear transformation method. Realize the filter using the most convenient realization form. [11+4]

7. Design an FIR linear phase filter using Kaiser window to meet the following specifications: [8]

$$0.98 \leq |H(e^{jw})| \leq 1.02, \text{ for } 0 \leq w \leq 0.9\pi$$

$$|H(e^{jw})| \leq 0.01, \text{ for } 0.14\pi \leq w \leq \pi$$

8. Draw the Howchart of Remez-Exchange theorem and explain it. [7]
9. Why we need FFT? Find 8-point DFT of sequence $x[n] = \{1, -1, 3, 2, 1, 1, 3, -2\}$ using Decimation in frequency Fast Fourier Transform (DIFFFT) algorithm. [2+6]
10. Find $x_3[n]$ if DFT of $x_3[n]$ is given by $X_3(k) = X_1(k) X_2(k)$ where $X_1(k)$ and $X_2(k)$ are 5-point DFT of $x_1[n] = \{1, -2, 5, 1, 2\}$ and $x_2[n] = \{1, 2, -3, -2\}$ respectively. [7]

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Digital Signal Analysis and Processing (CT704)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. Explain the process of calculating fourier series coefficients. [3]
2. Determine the system output $y(n)$ of the following signals: $h(n) = \{1,1,1\}$ and $x(n) = \{1,1,1,1\}$ [6]
3. Define a ROC. Find inverse Z-transform of $X(z) = z / \{(z-0.4)(z+1.5)^2\}$, ROC: $|z| < 0.4$ [1+5]
4. State linear constant coefficient difference equation and corresponding system function.
 Determine the output sequence of the system with impulse response $h[n] = (1/2)^n u[n]$ when the input signal is $x[n] = 10 - 5 \sin(\pi n / 2) + 20 \cos \pi n$ $-\infty < n < \infty$. [3+7]
5. The system function of a filter is $H(z) = 2 + 1.8z^{-1} - 1.6z^{-2} + z^{-3}$. Draw the Direct Form and Lattice Structure implementation of the above filter. [3+7]
6. Explain in detail about how rectangular window is used in FIR filter design. How Gibb's oscillations arise in this process. [6]
7. Explain about Remaz exchange algorithm with suitable derivation and flow chart. [9]
8. Using bilinear transformation, design a butterworth low pass filter which satisfies the following Magnitude Response. [12]

$$0.89125 \leq |H(e^{j\omega})| \leq 1 \quad \text{for } 0 \leq \omega \leq 0.2\pi$$

$$|H(e^{j\omega})| \leq 0.17783 \quad \text{for } 0.3\pi \leq \omega \leq \pi$$
9. Explain briefly about bilinear transformation method of IIR filter design. [3]
10. Why do we need DFT? Find 8-point DFT of sequence $x[n] = \{1, -1, 2, 2, 1, 1, 2, 2\}$ using Fast Fourier Transform algorithm. [2+6]
11. Find $x_3[n]$ if DFT of $x_3[n]$ is given by $X_3(k) = X_1(k) X_2(k)$ where $X_1(k)$ and $X_2(k)$ are 5-point DFT of $x_1[n] = \{1, -2, 2, 1, 4\}$ and $x_2[n] = \{2, 1, -3, -1\}$ respectively. [7]

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Digital Signal Analysis and Processing (CT704)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. How fourier series coefficients are calculated? Explain. [4]
2. Find the output of LTI system having impulse response $h[n]$ with $h[-2] = 1$, $h[0] = 2$, $h[1] = 3$ and input signal $x[n]$ with $x[0] = 1/2$, $x[2] = 2$, $x[3] = 3$. Also check the answer. [3+2]
3. Explain the properties of Region of Convergence with examples. [6]
4. Describe stability and causality characteristics of LTI system in terms of Impulse Response and ROC of its transfer function with suitable examples. [4]
5. Plot the pole-zero in z-plane and Draw Magnitude Response (not to the scale) of the system described by difference equation. [2+4]

$$y[n] - 0.4y[n-1] + 0.1y[n-2] = x[n] + 0.6x[n-1]$$
6. Determine the Direct Form I and Direct Form II realization of the following system. [5]

$$y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-2) + 0.6x(n-2)$$
7. Compute the lattice coefficients and draw the lattice structure of following FIR system. [5]

$$H(z) = 1 + 2z^{-1} + z^{-2}$$
8. Describe how digital FIR filter can be design by window method. Why Kaiser window is better than other fixed windows in FIR filter design? [5+3]
9. What is an optimum filter? Show mathematical expression of Remez exchange algorithm for FIR filter design. [1+6]
10. Explain about the advantages of selecting bilinear transformation method over impulse invariance method (I I M). Design a digital low pass Butterworth filter using impluse invariant transformation with pass band and stop band frequencies 200Hz and 500Hz respectively. The pass band and stop band attenuation are -5dB and -12dB respectively. The sampling frequency is 5kHz. Use IIM method. [3+12]
11. Find the FFT of the signal $x[n] \{1,1,2,4,3,1,2,1\}$ using DIT-FFT algorithm. [8]
12. Compute Circular Convolution of $h(n) = \{1, 2, 1, -1, 1\}$ and $x[n] = \{1, 2, 3, 1\}$. [7]

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Digital Signal Analysis and Processing (CT704)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Define energy and power signal. Check the signal $x[n] = u[n]$ and $x[n] = \delta[n]$ is Energy or Power type. [2+3]
2. Find the output of LTI system having impulse response $h[n] = (1/3)^n \{u[n+1]-u[n-2]\}$ and input signal $x[n] = \{2,1,0.5,3\}$. [5]
3. State the properties of region of convergence (ROC). Drive the convolution property of Z-transform. [3+3]
4. Find the output of LTI System having impulse response $h[n] = (1/2)^n u[n]$ and input signal $x[n] = 5e^{j\pi n/3}$ for $-\infty < n < \infty$. [4]
5. Plot Magnitude Response (not to the scale) of the system described by difference equation. [6]

$$y[n]-0.5y[n-1]+0.3y[n-2] = x[n]+0.7x[n-1]$$
6. Determine the Direct Form II realization of the following system [4]

$$y(n) = -0.1y(n-1)+0.72y(n-2)+0.7x(n)-0.252x(n-2)$$
7. Compute the lattice coefficients and draw the lattice structure of following FIR system [6]

$$H(z) = 1 + 2z^{-1} - 3z^{-2} + 4z^{-3}$$
8. Draw the flowchart of Remez-Exchange theorem and explain it. Design an FIR linear phase filter using Kaiser window to meet the following specifications: [6+8]

$$0.99 \leq |H(e^{j\omega})| \leq 1.01, \text{ for } 0 \leq \omega \leq 0.19\pi$$

$$|H(e^{j\omega})| \leq 0.01, \text{ for } 0.21\pi \leq \omega \leq \pi$$
9. Design a low pass digital filter by Bilinear Transformation method to an approximate Butterworth filter, if passband edge frequency is 0.25π radians and maximum deviation of 1 dB below 0 dB gain in the passband. The maximum gain of -15 dB and frequency is 0.45π radians in stopband, Consider sampling frequency 1Hz. [15]
10. Find 8-point DFT of sequence $x[n] = \{1,1,0,1,0,1,2\}$ using Decimation in Time Fast Fourier Transform (DITFFT) algorithm. [7]
11. Why we need DFT? If $X_1(k)$ and $X_2(k)$ are DFT of sequence $x_1[n] = \{1,2,4\}$ and $x_2[n] = \{-1,2,3,1\}$ respectively, then find the sequence $x_3[n]$, if DFT of $x_3[n]$ is given by $X_3(k) = X_1(k) X_2(k)$. [2+6]

Exam.	REGULATED		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Digital Signal Analysis and Processing (CT704)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Find the even and odd part of signal $x[n]$, [3]

$$x[n] = \begin{cases} 1 & \text{for } -4 \leq n \leq 0 \\ 2 & \text{for } 1 \leq n \leq 4 \end{cases}$$

2. A discrete time LTI system has impulse response $h(n) = \{1, 3, 2, -1, 1\}$ for $-1 \leq n \leq 3$. Determine the system output $y(n)$ if the input $x(n)$ is given by $x(n) = 2\delta(n) - \delta(n-1)$. [6]

3. Define ROC. Find inverse Z-transform of [1+5]

$$X(z) = 1 / \{(z - 0.5)(z + 2)\}, \text{ if}$$

i) ROC: $0.5 < |z| < 2$

ii) ROC: $|z| < 0.5$

iii) ROC: $|z| > 2$

4. The poles of a system are located at: $0.45 + 0.77i$ and $-2 \pm 0.3i$ and zeroes at: $1.2 \pm 3i$. Map the poles and zero in the z-plane and plot the magnitude response of the system. [2+8]

5. Compute Lattice coefficients and draw lattice structure for given IIR system $H(z) = 1 / (1 - 0.01z^{-1} - 0.23z^{-2} + 0.5z^{-3})$. Also check the stability of given system. [4+2+1]

6. What is limit cycle effect in recursive system? Describe with one example showing how it occurs. [3]

7. Design a low pass FIR filter having Pass band edge frequency $\omega_p = 0.3\pi$, Stop band edge frequency $\omega_s = 0.5\pi$ and Stop band attenuation $\alpha_s = 40$ dB using any appropriate window function. [8]

8. What is optimum filter? Show mathematical expression of Remez exchange algorithm for FIR filter design. [1+6]

9. What is the advantage of bilinear transformation? Design a low pass discrete time Butterworth filter applying bilinear transformation having specifications as follows: [2+9+4]

Pass band frequency (ω_p) = 0.25π radians

Stop band frequency (ω_s) = 0.55π radians

Pass band ripple (δ_p) = 0.11

and stop band ripple (δ_s) = 0.21

Consider sampling frequency 0.5 Hz.

Also, convert the obtained digital low-pass filter to high-pass filter with new pass band frequency (ω'_p) = 0.45π using digital domain transformation.

10. Why do we need Discrete Fourier Transform (DFT) although we have Discrete-time Fourier Transform (DTFT)? Find circular convolution between $x[n] = \{1, 2\}$ and $y[n] = u[n] - u[n-4]$. [2+5]

11. How fast is FFT? Draw the butterfly diagram and compute the value of $X(7)$ using 8 pt DIT-FFT for the following sequences: [2+6]

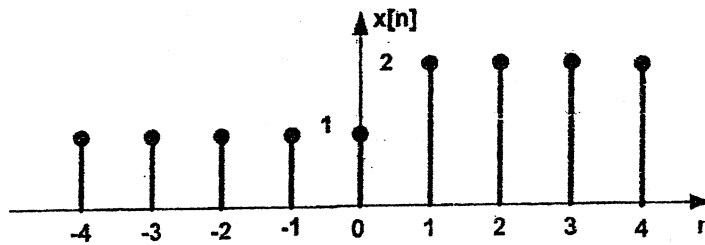
$$x(n) = \{1, 0, 0, 0, 0, 0, 0, 0\}$$

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Digital Signal Analysis and Processing (CT704)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Find the odd and even part of the following signal: [4+5]



A discrete time LTI system has input signal and impulse response as,

$$x[n] = \begin{cases} 1 & -1 \leq n \leq 1 \\ 0 & \text{elsewhere} \end{cases} \text{ and } h[n] = \begin{cases} 1 & -1 \leq n \leq 1 \\ 0 & \text{elsewhere} \end{cases} \text{ Find the output of the system using graphical method.}$$

2. Find the inverse z transform of: [6]

$$X(Z) = (1+2z^{-1}+z^{-2})/(1+1.5z^{-1}+0.5z^{-2}), |z| > 1$$

using partial fraction method.

3. Why do we need difference equation? State linear constant coefficient difference equation and corresponding system function. [2+3+5]

Consider an LTI system with impulse response $h[n] = (1/2)^n u[n]$. Determine $y[n]$, if the input is $x[n] = Ae^{in\pi}$

4. If a 3 stage lattice filter for all pole polynomial has coefficients. [5]

$$K_1 = \frac{1}{4}, K_2 = \frac{1}{2} \text{ and } K_3 = \frac{1}{3} \text{ Obtain the system function of this filter.}$$

5. What is the importance of quantization in Digital Signal Processing? Which one is better rounding or truncation? Explain about limit cycles in recursive system? Define dead band. [1+1+2+1]

6. Explain in detail about how rectangular window is used in FIR filter design. How Gibb's oscillations arise in this process. [6]

7. What is a Remez exchange algorithm? Derive its equation and draw its flow chart. [9]

8. Design a low pass digital filter by Bilinear Transformation method to an approximate Butter worth filter it passband frequency is 0.2π radians and maximum deviation of 1 db below 0 dB gain in the pass band. The maximum gain of -15 db and frequency is 0.4π radians in stop band, consider sampling frequency 1 Hz. [15]

9. A system has input signal $x[n] = \{1, 2, 3, 4\}$ and impulse response $h[n] = \{1, 3, 5, 7\}$ and the DFT of $x[n]$ is $X[k]$ and the DFT of $h[n]$ is $H[k]$. Find the output of the system $y[n]$ if $G[k] = X[k].H[k]$ [7]

10. Find DFT for $\{1, 1, 2, 0, 1, 2, 0, 1\}$, using FFT DIT butterfly algorithm and plot the spectrum. [6+2]

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Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Digital Signal Analysis and Processing (CT704)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Determine which of the following signals are periodic and compute their fundamental period: [3]
 - i) $\cos(\pi n^2/8)$
 - ii) $\cos(n/2) \cos(\pi n/4)$
2. Find output, $y(n)$ when: $h(n) = \{5,4,3,2\}$ and $x(n) = \{1,0,3,2\}$ [6]
3. List out the properties of Region of Convergence. Find the Z-transform and locate the ROC of the signal. [2+4]

$$x[n] = \left(-\frac{1}{3}\right)^n u[n] - \left(\frac{1}{3}\right)^n u[-n-1]$$
4. Find the output of LTI System having impulse response [4]

$$h[n] = (1/3)^n u[n] \text{ and input signal } x[n] = 5e^{jm/2} \text{ for } -\infty < n < \infty .$$
5. Plot Magnitude Response (not to the scale) of the system described by difference equation. $y[n] - 0.3 y[n-1] + 0.225y[n-2] = x[n] + 0.5x[n-1]$ [6]
6. Determine the Cascade Form realization of the following system. [4]

$$y[n] - \frac{3}{4}y[n-1] + \frac{1}{8}y[n-2] - x[n] - 2x[n-1] = 0$$
7. Compute the lattice coefficients and draw the lattice structure of following FIR system [6]

$$H(z) = 1 + 3.1z^{-1} + 5.5z^{-2} + 4.2z^{-3} + 2.3z^{-4}$$
8. Describe how FIR filter can be designed by window method. Discuss the characteristics of different type of window function. [4+4]
9. What is an optimum filter? Show mathematical expression of Remez exchange algorithm for FIR filter design. [1+6]
10. Using bilinear transformation method, design a digital filter using Butterworth approximation which satisfies the following conditions: [10]

$$0.8 \leq |H e^{jw}| \leq 1 \quad \text{for } 0 \leq w \leq 0.2\pi$$

$$|H e^{jw}| \leq 0.2 \quad \text{for } 0.6\pi \leq w \leq \pi$$
11. A digital LPF with cut off frequency $w_c = 0.2575 \pi$ is given as $H(Z) = \frac{0.1 + 0.4z^{-1}}{1 - 0.6z^{-1} + 0.1z^{-2}}$ [5]

Design a digital high pass filter with $w'_c = 0.3567\pi$. [1+6]
12. Define Padding zones. Find 8-point DFT of sequence. [1+6]
 $x[n] = \{1,1,0,0,1,1,2\}$ using Decimation in Time Fast Fourier Transform (DITFFT) algorithm.
13. Why we need DFT? State and prove Circular Convolution property of DFT. [2+2+4]

Exam.	New Batch (2066 & 1999 Batch)		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Digital Signal Analysis and Processing (CT704)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Find the even and odd part of signal $x[n]$, [3]

$$x[n] = \begin{cases} 1 & \text{for } -4 \leq n \leq 0 \\ 2 & \text{for } 1 \leq n \leq 4 \end{cases}$$
2. Illustrate the significance of convolution summation in digital signal analysis. Compute the convolution of the following signals: $h(n) = \{1, 0, 1\}$ and $x(n) = \{1, -2, -2, 3, 4\}$ [2+4]
3. Define Region of Convergence. Find inverse Z - transform of $X(z) = z / \{(z-1)(z-2)^2\}$, ROC: $|Z| < 1$ [1+5]
4. Given $H(z)$ for a system with the following difference equation: $y(n) = x(n) + x(n-2)$ [2+6+2]
 Plot its poles and zeros in Z plane. Determine its magnitude response. Also, determine whether system is causal and stable.
5. Draw lattice structure for given pole - zero system [6]
 $H(z) = (0.5 + 2z^{-1} + 0.6z^{-2}) / (1 - 0.3z^{-1} + 0.4z^{-2})$
6. What do you mean by Limit Cycle? How it occurs in recursive system? [1+3]
7. What is the condition satisfied by Linear phase FIR filter? Show that the filter with $h(n) = \{-1, 0, 1\}$ is a linear phase filter. [2+4]
8. Use Hanning window method to design a digital low-pass FIR filter with pass-band edge frequency $(\omega_p) = 0.25\pi$, stop-band edge frequency $(\omega_s) = 0.35\pi$ where main lobe width of Hanning window is $8\pi/M$, M is the filter length. [9]
9. Why Spectral Transformation is required? [2]
10. Design a low pass digital filter by impulse invariance method to an approximate Butterworth filter, if passband edge frequency is 0.2π radians and maximum deviation of 0.5 dB below 0 dB gain in the passband. The maximum gain of -15 dB and frequency is 0.35π radian in stopband, consider sampling frequency 1Hz. [13]
11. Why do we need Discrete Fourier Transform (DFT) although we have Discrete-time Fourier Transform (DTFT)? Find circular convolution between $x[n] = \{1, 2\}$ and $y[n] = u[n] - u[n-4]$. [2+5]
12. How fast is FFT? Draw the butterfly diagram and compute the value of $x(7)$ using 8 pt DIT-FFT for the following sequences: [2+6]
 $x(n) = \{1, 0, 0, 0, 0, 0, 0, 0\}$

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Digital Signal Analysis and Processing (CT704)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Define Energy and Power type signal with suitable example. Check the signal $x[n] = \cos(2\pi n/5) + \sin(\pi n/3)$ is periodic or not. [2+2]
2. Define LTI system. Find the output of LTI system having impulse response $h[n] = 2u[n] - 2u[n-4]$ and input signal $x[n] = (1/3)^n u[n]$. [1+4]
3. State the properties of region of convergence (ROC)? Derive the time shifting property of Z-transform. [3+3]
4. Why do we need Difference Equation? Draw Pole-zero in Z-Plane and plot magnitude response (not to the scale) of the system described by difference equation $y[n] - 0.4y[n-1] + 0.2y[n-2] = x[n] + 0.1x[n-1] - 0.06x[n-2]$ [2+2+6]
5. Determine the Direct Form II realization of the following system $y(n) = -0.1y(n-1) + 0.72y(n-2) + 0.7x(n) - 0.252x(n-2)$ [4]
6. Compute the lattice coefficients and draw the lattice structure of following FIR system $H(z) = 1 + 2z^{-1} - 3z^{-2} + 4z^{-3}$ [6]
7. Design a digital FIR filter for the design of the low pass filter having $\omega_p = 0.3\pi$, $\omega_s = 0.5\pi$, $\alpha_s = 40$ dB using suitable window function. [8]
8. What is optimum filter? Describe Remez exchange algorithm for FIR filter design with flow chart. [1+6]
9. What is the advantage of bilinear transformation? Design a low pass discrete time Butterworth filter applying bilinear transformation having specifications as follows: [2+9+4]
 - Pass band frequency (ω_p) = 0.25π radians
 - Stop band frequency (ω_s) = 0.55π radians
 - Pass band ripple (δ_p) = 0.11
 - And stop band ripple (δ_s) = 0.21

Consider sampling frequency 0.5Hz

Also, convert the obtained digital low-pass filter to high-pass filter with new pass band frequency (ω'_p) = 0.45π using digital domain transformation.
10. Why do we need FFT? Find 8-point DFT of sequence $x[n] = \{1, 1, 2, 2, 1, 1, 2, 1\}$ using Decimation in frequency FFT (DIFFT) algorithm. [2+7]
11. Find $x_3[n]$ if DFT of $x_3[n]$ is given by $X_3(k) = X_1(k) X_2(k)$ where $X_1(k)$ and $X_2(k)$ are 4-point DFT of $x_1[n] = \{1, 2, -2\}$ and $x_2[n] = \{1, 2, 3, -1\}$ respectively. [6]

Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / II	Time	3 h rs.

Subject: - Digital Signal Analysis and Processing (EG774CT)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Plot the sequence $x[n] = u[n + 8] - u[n - 4]$. [3]
2. What is the period of following signals? [4]
 - (a) $x[n] = \cos\left(\frac{11\pi}{3}n\right)$
 - (b) $x[n] = e^{j\frac{7}{5}n}$
3. What is a sampling? How are the spectrum of continuous time signal and the spectrum of signal obtained by sampling the continuous time signal related? Illustrate with diagram. [6]
4. Write about the following properties of discrete time system: [5]

[a] linearity, [b] time invariance, [c] memory, [d] causality [e] stability.
5. Find the frequency response $H(e^{j\omega})$ of the system characterized by difference equation $y[n] - 0.8y[n - 1] + 0.15y[n - 2] - x[n] = 0$. Plot the frequency response of the system. [6]
6. Realize the system function [6]

$$H(z) = \frac{-1}{(1 - 0.5z^{-1})(1 - 0.7e^{-j\frac{\pi}{4}}z^{-1})(1 - 0.7e^{j\frac{\pi}{4}}z^{-1})(1 - 0.3z^{-1})}$$

in terms of cascade of second order sections. Draw the block diagram of the cascade realization.
7. Write about the sign magnitude and 2's complement representation of binary fractional number. Write about truncation error and rounding error. [6]
8. Describe digital Butterworth filter design using impulse invariance technique. What are the limitations of impulse invariance technique? [15]
9. Derive the expression for frequency response of symmetric linear phase filter of length M , where M is odd. [6]
10. Use the Hanning window to design a digital low-pass FIR filter with Pass band frequency $(\omega_p) = 0.25\pi$ and Stop band frequency $(\omega_s) = 0.3\pi$. [8]
11. Perform circular convolution of the sequences $x[n] = [1 \ 0 \ 1]$ and $h[n] = [1 \ 0 \ 2 \ 1]$. [5]
12. Write about multiplication and convolution property of Discrete Fourier Transform. [6]
13. Draw the flow diagram of four point decimation in time Fast Fourier Transform algorithm. [4]

Exam.	Regular / Back		
	Level	BE	Full Marks
Programme	BCT	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Digital Signal Analysis and Processing

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Find the energy and power of the signal $x[n] = u[n]$. [5]
2. Find the period of the signal $x[n] = \sum_{m=-\infty}^{\infty} \delta[n - 2 - 3m]$. Find the Fourier series coefficients of the signal $x[n]$. [6]
3. State whether or not the system $y[n] = e^{x[2n]}$ is (a) linear (b) time invariant (c) memoryless (d) causal. Where $x[n]$ is input to system and $y[n]$ is output of system. [5]
4. Convolve the sequences $x[n] = 3^n u[-n - 5]$ and $y[n] = u[n - 5]$. [5]
5. Find the frequency response of the linear time invariant system characterized by difference equation $y[n] - \frac{10}{24}y[n-1] + \frac{1}{24}y[n-2] = x[n]$. If input to the system is $x[n] = \sin\left(\frac{\pi}{3}n\right) + \sin\left(\frac{\pi}{5}n\right)$ then determine output $y[n]$ of the system. [7]
6. Realize the overall system function: [9]

$$H(z) = \frac{(1 - \frac{1}{5}e^{-j\frac{\pi}{5}}z^{-1})(1 - \frac{1}{3}z^{-1})(1 - \frac{1}{5}e^{j\frac{\pi}{5}}z^{-1})}{(1 - \frac{4}{5}z^{-1})(1 - \frac{1}{7}e^{j\frac{\pi}{7}}z^{-1})(1 - \frac{1}{5}z^{-1})(1 - \frac{1}{7}e^{-j\frac{\pi}{7}}z^{-1})}$$

In terms of direct form I and direct form II structures. Draw the corresponding block diagrams of direct form I and direct form II structures.

7. How the spectrum of continuous time signal is related to spectrum of corresponding discrete time signal obtained by sampling the continuous time signal? Explain. Discuss what is aliasing and how it occurs. [8]
8. If passband edge frequency $\omega_p = 0.25\pi$, stopband edge frequency $\omega_s = 0.45\pi$, passband ripple $\delta_p = 0.17$ and stopband ripple $\delta_s = 0.27$ then design a digital lowpass Butterworth filter using bilinear transformation technique. [18]
9. Use Blackman window method to design a digital low-pass FIR filter with passband edge frequency $\omega_p = 0.24\pi$, stopband edge frequency $\omega_s = 0.34\pi$ where main lobe width of Blackman window is $\frac{12\pi}{M}$, M is filter length. [9]
10. Use the Fast Fourier Transform decimation in frequency algorithm to find the discrete Fourier Transform of the sequence $x[n] = [1 -2 2 1]$. [8]

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Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Data Mining (Elective I)(CT72502)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What is Data Mining? What are the steps involved in knowledge discovery process? [1+5]
2. Explain typical OLAP operations over a multidimensional data warehouse? Differentiate between OLAP and OLTP tools. [6+4]
3. Draw decision tree for the given data using ID3 algorithm. [10]

Age	Income	Student	Credit Rating	Buy's Computer
Youth	High	No	Fair	No
Youth	High	No	Excellent	No
Middle Aged	High	No	Fair	Yes
Senior	Medium	No	Fair	Yes
Senior	Low	Yes	Fair	Yes
Senior	Low	Yes	Excellent	No
Middle Aged	Low	Yes	Excellent	Yes
Youth	Medium	No	Fair	No
Youth	Low	Yes	Fair	Yes
Senior	Medium	Yes	Fair	Yes
Youth	Medium	Yes	Excellent	Yes
Middle Aged	Medium	No	Excellent	Yes
Middle Aged	High	Yes	Fair	Yes
Senior	Medium	No	Excellent	No

4. Suppose you have a test record "X = (Home Owner = No, Marital Status = Married, Income = \$120K)". Your job is to classify this record using Naive Bayesian Classification. Use the following table for your calculations. [6]

Tid	Home Owner	Marital Status	Annual Income	Defaulted Borrower
1	Yes	Single	125K	No
2	No	Married	100K	No
3	No	Single	70K	No
4	Yes	Married	120K	No
5	No	Divorced	95K	Yes
6	No	Married	60K	No
7	Yes	Divorced	220K	No
8	No	Single	85K	Yes
9	No	Married	75K	No
10	No	Single	90K	Yes

5. Derive association rule for the following market basket transactions.

[8]

Minimum support = 50%

Minimum confidence = 80%

Transaction ID	Item Set
1	A,B
2	A,D
3	A,C
4	B,E
5	B,D,E
6	A,E,C

6. a) How do you handle the categorical attributes in data mining process? Explain with example. Generate the at least four subsequences from the given sequence: $\langle \{2,3,5\}, \{6,7,8\}, \{9,1\}, \{7,4\} \rangle$.

[3+3]

b) What are subgraph pattern?

[2]

7. What are core, border and noise points? Write the algorithm of DBSCAN clustering and explain how it is useful in handling the noisy data.

[3+5]

8. An internet marketer is interesting in segmenting internet based the input attributes – top ten search key words used, top 10 URLs, recent 10 online purchases (vendor, product, qty, amt), Internet usage level, heaviest access hour, and heaviest access day of a week. Which clustering algorithm do you think can be used for segmentation? How do you validate the cluster which has been created?

[2+6]

9. What do you mean by anomaly detection? Why is it important and where is it applicable?

[3+3]

10. Write short notes on:

[2×5]

a) Page Rank algorithm

b) FP-Tree

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Data Mining (Elective I) (CT72502)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Describe the process of knowledge discovery in databases. Explain the specific challenges that motivated the development of data mining. [3+3]
2. Suppose that the data for analysis include the attribute the frequency of stop words in documents. The values are given in increasing order: 13, 15, 16, 16, 19, 20, 20, 21, 22, 22, 25, 25, 25, 25, 30, 33, 33, 33, 35, 35, 35, 35, 36, 40, 45, 46, 52, 70. [6]
 - a) Use smoothing by bin means with a depth of 3.
 - b) Use min-max normalization to transform the value 35 into the range from 0.0 to 1.0.
 - c) Use z-score normalization to transform the value 35 where the standard deviation of the above frequency is 12.94.
 - d) Use normalization by decimal scaling to transform the value 35.
3. What are nominal and ordinal attributes? Discuss how to handle missing data and noisy data during data cleaning process. [6]
4. Describe the working mechanism as well as the merits and demerits of the holdout method, random sampling, k-cross validation and bootstrap approaches in evaluating the performance of a classifier. [8]
5. a) Write Apriori algorithm and using the algorithm find all the frequent itemset for the following database. (min_sup = 20%). [5]

TID	A1	A2	A3	A4	A5	A6	A7	AB	A9
T2	0	1	0	1	0	0	0	1	0
T3	0	0	0	1	1	0	1	0	0
T4	0	0	1	0	0	0	0	0	0
T5	0	0	0	0	1	1	1	0	0
T6	0	1	1	1	0	0	0	0	0
T7	0	1	0	0	0	1	1	0	1
T8	0	0	0	0	1	0	0	0	0

- b) Is it possible to generate any rules out of the frequent items, considering any value of confidence threshold? [3]
6. Given the following confusion matrix, determine Accuracy, Error rate, Sensitivity, Specificity, Precision, Recall of the classifier model. [4]

n = 165	Predicted:		
	NO	YES	
Actual: NO	TN = 50	FP = 10	60
Actual: YES	FN = 5	TP = 100	105
	55	110	

7. How does FP growth approach generate frequent item sets without generating candidate item sets? Explain with an example. [6]

8. Define clustering. Given the matrix whose column represent different data points, perform a K-means clustering on this dataset using the Manhattan as the distance function. The center of the 3 clusters are initiated as A(6.2, 3.2), B(6.6, 3.7) and C(6.5, 3.0). Provide the final cluster centers after 3 iteration. [8]

5.9	4.6	6.2	4.7	5.5	5.0	4.9	6.7	5.1	6.0
3.2	2.9	2.8	3.2	4.2	3.0	3.1	3.1	3.8	3.0

9. Explain hierarchical clustering method with an example of Dendogram plot. [6]

10. Describe the strengths and weaknesses of the statistical, proximity-based, density-based and cluster-based approaches of anomaly detection. [6]

11. Write short notes on: [4×4]

- a) Time Series data mining
- b) Web mining
- c) Data visualization
- d) DBSCAN clustering

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Data Mining (Elective I)(CT 72502)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Explain how data mining system can be integrated with database/data warehouse system. Explain Data mining process with diagram. [4+2]

2. Suppose that a data warehouse consists of the four dimensions data, spectator, location, and game, and the two measures count and charge, where charge is the fare that a spectator pays when watching a game on a given date. Spectators may be students, adults or seniors, with each category having its own charge rate. [3+3]

- a) Draw a star schema diagram for the data warehouse.
- b) Starting with the base cuboid [data, spectator, location, game], what specific OLAP operations should you perform in order to list the total charge paid by student spectators at Dashrath Stadium in 2021?

3. Use the following methods to normalize the data: 200, 300, 400, 600 and 1000. [2+2+2]

- a) Min-max normalization by setting min=0 and max=1
- b) Z-score normalization
- c) Normalization by decimal scaling

4. Construct a decision tree for the following data set using information gain. [8]

Predict the class label for a data point with values <Female, 2, standard, high>

Gender	Car ownership	Travel cost	Income level	Transport mode
Male	0	Cheap	Low	Bus
Male	1	Cheap	Medium	Bus
Female	0	Cheap	Low	Bus
Male	1	Cheap	Medium	Bus
Female	1	Expensive	High	Car
Male	2	Expensive	Medium	Car
Female	2	Expensive	High	Car
Female	1	Cheap	Medium	Train
Male	0	Standard	Medium	Train
Female	1	Standard	Medium	Train

5. Consider the given transactional database from a grocery store. Use a support threshold of 33.34% and confidence threshold of 60% to compute the following: [4+4]

- a) Build a frequent pattern tree (FP-Tree). Show for each transaction how the tree evolves.
- b) Use FP-Growth algorithm to discover the frequent itemsets from this FP-tree.

Transaction ID	Items
T1	HotDogs, Buns, Ketchup
T2	HotDogs, Buns
T3	HotDogs, Coke, Chips
T4	Chips, Coke
T5	Chips, Ketchup
T6	HotDogs, Coke, Chips

6. Calculate: Accuracy, TPR, FPR and Precision for the given confusion matrix for a classifier. [4]

Predicted Class	Actual Class	
	Class 1	Class 2
Class 1	142	40
Class 2	98	720

7. Explain Naive Bayesian classification algorithm with suitable example. [6]
8. Write K-means clustering algorithm. Generate two clusters from following dataset using K-means clustering. [2+6]

Instance	A	B
1	1	2
2	2.5	1
3	3.5	1.5
4	4	1
5	3.5	2.5
6	5	3

9. Provide answers to the following with regard to the DBSCAN clustering approach: [2+2+2]
- How does the DBSCAN quantify the neighborhood of an object? How is a large dense region assembled from small dense regions centered by core objects?
 - How does DBSCAN find clusters? How are the neighborhood threshold (Epsilon) and minimum number of points (MinPts) determined empirically in DBSCAN?
 - Prove that in DBSCAN, for a fixed minimum number of points (MinPts) value and two neighborhood thresholds, $\text{Epsilon}_1 < \text{Epsilon}_2$, a cluster (C) with respect to Epsilon_1 and MinPts must be a subset of a subset of a cluster (K) with respect to Epsilon_2 and MinPts.
10. Compare and contrast among three different methods of anomaly detection. [6]
11. Write short notes on: [4×4]
- Minkowski Distance
 - Laplacian Correction in Classification method
 - Page rank algorithm in Web mining
 - Overfitting problem in classification

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Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: Data Mining (Elective I) (CT72502)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Find the principal components and the proportion of the total variance explained by each when the covariance matrix of the three random variables X_1 , X_2 , and X_3 is: [4]

$$\Sigma = \begin{bmatrix} 1 & -2 & 0 \\ -2 & 5 & 0 \\ 0 & 0 & 2 \end{bmatrix}$$

2. (a) Given the following points compute the distance matrix using the Manhattan and the Supremum distance. [2+1+2]

Points	X	Y
P1	6	3
P2	2	2
P3	3	4

- (b) Given the following two vectors compute the Cosine similarity between them.
 $D1 = [4 \ 0 \ 2 \ 0 \ 1]$
 $D2 = [2 \ 0 \ 0 \ 2 \ 2]$

- (c) Given the following two binary vectors compute the Jaccard similarity and Simple Matching Coefficient.

$$P = [0 \ 0 \ 1 \ 1 \ 0 \ 1]$$

$$Q = [1 \ 1 \ 1 \ 1 \ 0 \ 1]$$

3. Suppose that a data warehouse for a sales company consists of five dimensions: *time*, *location*, *supplier*, *brand*, and *product*, and two measures: *count* and *price*. [3+3]

- (a) Draw a *snowflake schema* diagram for the data warehouse.
 (b) Starting with the base cuboid [*time*, *location*, *supplier*, *brand*, *product*], what specific OLAP operations should one perform in order to list the total *count* for a certain *brand* for each *state* per *year* (assume *location* has three levels: *country*, *state*, *city*; and assume *time* has three levels: *year*, *month*, *day*)?

4. Why is a conflict resolution strategy often necessary for rule-based classifiers? Describe the common conflict resolution strategies for rule-based classifiers. [2+4]

5. The following dataset will be used to train a decision tree for predicting whether a mushroom is edible or not based on its shape, color and odor. [2+5]

Shape	Color	Odor	Edible
C	B	1	Yes
D	B	1	Yes
D	W	1	Yes
D	W	2	Yes

C	B	2	Yes
D	B	2	No
D	G	2	No
C	U	2	No
C	B	3	Ne
D	W	3	No

- (a) Which attribute would the ID-3 algorithm choose to use for the root of the decision tree?
 (b) Draw the full decision tree that would be learned for the given data.

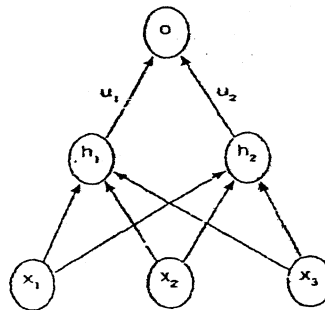
6. Consider the multi-layer feed-forward neural network shown in the following figure. This neural network has three inputs (x_1), (x_2) and (x_3) connected to a hidden layer consisting of two nodes (h_1) and (h_2). The weight of the edge connecting (x_i) to (h_j) is (w_{ji}). The two hidden nodes are connected to the output node (o). The weight of the edge connecting the hidden node (h_i) to the output node (o) is (u_i). The activation functions at hidden and output layers is set to sigmoid function defined as follows:

[2+3+4]

$$\sigma(\theta) = \frac{1}{1 + \exp(-\theta)}$$

Using the target output (t), the squared error is used as the loss function at the output node, and is defined as:

$$E(o, t) = \frac{1}{2} (o - t)^2$$



- (a) Using the symbols given above, compute the activation at (h_1).
 (b) Compute the gradient of the loss with respect to the output (o).
 (c) Compute the gradient of the loss with respect to the weight (w_{12}).

7. Consider the transaction data shown in the following table from a fast food restaurant.

[5+3]

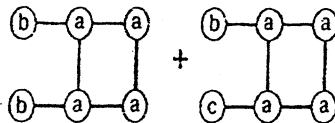
Meal Item	List of Item IDs
Order:1	M1, M2, M5
Order:2	M2, M4
Order:3	M2, M3
Order:4	M1, M2, M4
Order:5	M1, M3
Order:6	M2, M3
Order:7	M1, M3

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Order:8	M1, M2, M3, M5
Order:9	M1, M2, M3

There are 9 distinct transactions (Order: 1 – Order: 9) and each transaction involves between 2 and 4 meal items. There are a total of 5 meal items that are involved in the transactions. For simplicity, the meal items have been assigned short names (M1-M5). Assume that the minimum support is $2/9$ and the minimum confidence is $7/9$.

- (a) Apply the Apriori algorithm to the dataset of transactions and identify all frequent k-itemsets.
- (b) Find all strong association rules of the form: $X \wedge Y \rightarrow Z$ and note their confidence values.
8. (a) List all the 4-subsequences contained in the data sequence: $\langle \{1,3\} \{2\} \{2,3\} \{4\} \rangle$
- (b) Draw all candidate sub-graphs obtained from joining the pair of graphs shown below using edge-growing method to expand the sub-graphs.



[3+3]

9. Given the matrix (X) whose rows represent different data points, perform a k-means clustering on this dataset using the Euclidean distance as the distance function. Here (K) is chosen as 3. The center of the 3 clusters are initialized as red (6.2, 3.2), green (6.6, 3.7) and blue (6.5, 3.0). Provide the final cluster centers and comment on the number of iterations required for the clusters to converge.

[8]

$$X = \begin{bmatrix} 5.9 & 3.2 \\ 4.6 & 2.9 \\ 6.2 & 2.8 \\ 4.7 & 3.2 \\ 5.5 & 4.2 \\ 5.0 & 3.0 \\ 4.9 & 3.1 \\ 6.7 & 3.1 \\ 5.1 & 3.8 \\ 6.0 & 3.0 \end{bmatrix}$$

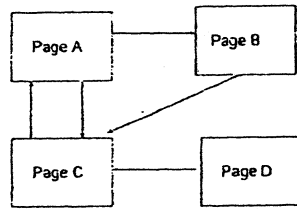
10. The table below is a distance matrix for six objects:

[4+4]

	A	B	C	D	E	F
A	0					
B	0.12	0				
C	0.51	0.25	0			
D	0.84	0.16	0.14	0		
E	0.28	0.77	0.70	0.45	0	
F	0.34	0.61	0.93	0.20	0.67	0

- (a) Show the final result of hierarchical clustering with single-link by drawing a dendrogram.
- (b) Show the final result of hierarchical clustering with complete-link by drawing a dendrogram.

11. (a) Discuss the issues related to anomaly detection. [2]
(b) If the probability that a normal object is classified as an anomaly is 0.01 and the probability that an anomalous object is classified as anomalous is 0.99, then what is the false alarm rate and detection rate if 99% of the objects are normal? [3]
12. Consider the following subset of pages and their links. Apply the PageRank algorithm using a damping factor of 0.85. A minimum of five iterations are required. Assume initial page rank of all pages is 0.25. [8]



Exam.	Back		
	Level	BE	Full Marks
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Data Mining (Elective I) (CT72502)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What are the fundamental differences between Data Mining and Data Warehousing?
Describe the steps of KDD for data mining. [3+7]
2. What do you mean by dimensional data? What are base & apex cuboid? Slicing & Dicing?
Roll Down and Roll UP operations? Give example. [2+3+3+3]
3. How do you measure the accuracy of classifiers? How do you select best root attribute in
decision tree? Explain. [4+6]
4. What are prior and posterior probabilities? Explain the algorithmic steps of Bayesian
classifier and write its strengths. [3+7]
5. For the transactions given below, consider confidence=60% and minimum support=30%.
Identify large itemsets (L-Itemset) at L=3 with possible associations using A-priori
algorithm and generate F-List using FP-Growth algorithm. [12]

Transactions	Items description
T1	A, B, C, T, M, P, D, K
T2	A, B, T, P, D, K
T3	B, C, T, D, M, A, P
T4	A, C, T, M, D,
T5	A, C, D, K, M
T6	B, C, T

6. How DBSCAN algorithm works? How do we avoid the issues of DBSCAN? [8+2]
7. Explain web mining taxonomy. [8]
8. Write short notes on (Any Three) [3+3+3]
 - a. Data smoothing techniques
 - b. Clustering and its application in anomaly detection
 - c. AprioriALL: Sequential pattern mining algorithm
 - d. Various similarity measures between data tuples.

Exam.	BCT		
Level	BE	Full Marks	80
Programme	BCT, BEX	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Data Mining (Elective I) (CT72502)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. How is data warehouse different from a database? How are they similar? [2+2]
2. Discuss issues to consider during Data Integration. Describe OLAP and operations on OLAP with suitable example. [5+5]
3. Explain Naïve Bayesian classification with suitable example. [8]
4. The confusion matrix for a classifier is given as follows: [10]

	Predicted Class	
	Class 1	Class 2
Class 1	21	6
Class 2	7	41

Calculate: Accuracy, Sensitivity, Specificity and Precision.

5. Why association analysis is required in data mining? Explain Apriori principle with example. [2+6]
6. What are the advantages of FP growth method? Explain FP growth algorithm. [2+6]
7. Explain K-means clustering with limitation. Generate two clusters from following dataset using K-means clustering. [4+6]

A	B
1	2
2.5	4.5
4	6
3.5	4
4	5.5
3	6

8. What are outliers? Explain an algorithm that can be used to generate density based clusters. [8]
9. Why anomaly detection is important? Explain distance based method for anomaly detection. [2+6]
10. Explain Web mining and Multimedia mining. [6]

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Data Mining (Elective I) (CT72502)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. What is data warehouse and data mart? Describe Snowflake scheme with example. [2+4]
2. What are the approaches to handle missing data? Describe OLAP and operations on OLAP with suitable example. Differentiate between OLAP and OLTP. [2+5+3]
3. Draw clear block diagram depicting different stages in classification. Explain the inverse relation between precision and recall. Given the confusion matrix, determine accuracy, sensitivity and precision of the classifier model. [2+3+5]

Actual \ Predicted	Positive	Negative
	Positive	142
Negative	98	720

4. Explain decision tree with the concept of Naive base classification with appropriate example. [10]
5. Why association analysis is required in data mining? Explain apriori principle with example. [2+6]
6. How does FP growth approach overcomes the disadvantages of Apriori algorithm. For the transaction data given in table generate FP-Tree. [2+8]

Transaction ID	Item set
T1	Camera, Laptop, Pen drive
T2	Laptop, Pen drive
T3	Laptop, Mobile, Earphone
T4	Earphone, Mobile
T5	Camera, Earphone
T6	Laptop, Mobile, Earphone

7. Describe the difference between Hierarchical and partitioning clustering. How K-means clustering is applied? Verify using example. [2+8]
8. What do you mean by anomaly detection and why is it important? Describe distance based approaches for anomaly detection. [4+3]
9. Write short notes on: (any three) [3×3]
 - i) Issues in clustering
 - ii) Multimedia mining
 - iii) Time series data mining
 - iv) Web mining

Exam.	Regular		
	Level	BE	Full Marks
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Data Mining (Elective II) (CT72502)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What is data mining? Explain all the steps of knowledge discovery. [2+6]
2. How do you perform analysis of multidimensional data? Explain with the concept of OLAP. [10]
3. Predict Class label using naive Bayesian classifier for X = (age = youth, income = medium, student = yes, credit-rating = fair) using the following data set. [10]

RID	Age	Income	Student	Credit-rating	Class Buy computer
1	Youth	High	No	Fair	No
2	Youth	High	No	Excellent	No
3	Middle-age	High	No	Fair	Yes
4	Senior	Medium	No	Fair	Yes
5	Senior	Low	Yes	Fair	Yes
6	Senior	Low	Yes	Excellent	No
7	Middle-age	Low	Yes	Excellent	Yes
8	Youth	Medium	No	Fair	No
9	Youth	Low	Yes	Fair	Yes
10	Senior	Medium	Yes	Fair	Yes
11	Youth	Medium	Yes	Excellent	Yes
12	Middle-age	Medium	No	Excellent	Yes
13	Middle-age	High	Yes	Fair	Yes
14	Senior	Medium	No	Excellent	No

4. The confusion matrix for a classifier is given as follows: [10]

		actual class	
		class1	class2
predicted class	class1	21	6
	class2	7	41

- calculate
- a. accuracy
 - b. sensitivity
 - c. specificity
 - d. precision
 - e. recall

5. What is the importance of SUPPORT and COFIDENCE during association analysis? Explain FP-Growth method with example. [10]
6. What are the types of clustering methods? Explain DBSCAN method of clustering with an example. [10]
7. What is the use of Apriori Algorithm in market basket analysis? Explain with suitable example. [10]
8. Write short notes on: [4×3]
 - i) Time series Data mining
 - ii) Issues in anomaly/Fraud detection
 - iii) Categorical data and related issues

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Data Mining (Elective I) (CT72502)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. What is a data mining? Explain general steps in brief. [4]
2. Why data preprocessing is required in the data mining? Explain some of approaches of data clearing. [5+5]
3. Write about Hunt's Algorithm for Decision Tree induction. Explain the test conditions that can be used for different attribute types. [10]
4. What is an ANN classifier? Explain its general consideration that required for the classifier. [2+6]
5. What is an association analysis? Explain its importance in market-basket analysis. [2+5]
6. What is a Frequent item set? Explain FP growth method with example. [1+8]
7. What is a cluster analysis? How it is different from classification? [5]
8. Explain a DBSCAN algorithm with example. [7]
9. What is an Anomaly detection? Discuss its importance in security. [5]
10. Explain Time series data mining in brief. [6]
11. Write short notes on: [3×3]
 - i) Data transformation
 - ii) Sequential pattern
 - iii) Cluster evaluation

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Data Mining (Elective I) (CT725)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. a) What is "curve of Dimensionality"? How can it be avoided? [5]
 b) Discuss the impact of noisy data in data mining? [5]
2. Explain rule based classifier? How can CN2 Algorithm be used for rule based classification? Define "Accuracy" and "Laplace" measures used for rule evaluation. [9]
3. An input sequence "A A B B B A A A B B" was used for classification. The Classifier 'X' predicted the sequences as: "A A B B B A A A B B" where as the Classifier 'Y' predicted the sequences as: "A A A A B B A A A B". Develop the corresponding confusion matrix for the classifiers and find their corresponding. [10]
 i) Accuracy
 ii) Precision
 iii) True Positive Rate
 iv) False Positive Rate
4. Explain Apriori algorithm. Use Apriori to generate frequent item sets with support of 50% for the following transaction database. [10]

TID	Items
1	ACD
2	BD
3	ABCE
4	BDF

5. Why is pattern evaluation important in association rule mining? Explain with example the statistical based measures used for measuring interestingness of association rules. [8]
6. What is a density based cluster. Explain an algorithm that can be used to generate density based clusters. [8]
7. What is Hierarchical Clustering? Differentiate between agglomerative and divisive approach of hierarchical clustering. Augment your answer with appropriate illustrative examples. [10]
8. Write short notes on: [15]
 - i) Data ware house and Data mart
 - ii) Base Rate Fallacy
 - iii) Web mining
 - iv) Anomaly Detection
 - v) Convex Hull Method

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Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Biomedical Instrumentation (Elective I) (EX725)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. a) Describe wireless telemetry process and range of frequency set by WMTS for eligible wireless medical telemetry system. Draw the overall diagram showing the information flow between telemedicine unit and base unit. [8]
- b) "The process of changing from resting state to action potential is depolarization". Explain the phenomenon regarding the generation of resting potential and action potential with neat diagram and related waveform. Draw the equivalent circuit of bio-potential electrode. [8]
2. a) Write down the typical characteristics of ECG, EEG and EMG. Explain the 12 leads configuration of ECG measurement. [8]
- b) Discuss the blood flow mechanism in human body. Explain the electromagnetic blood flow meter with neat diagrams. [8]
3. a) Explain the block diagram of EEG machine. Describe the different frequency bands or rhythm related to EEG. [8]
- b) Describe dialysis and the function of dialyzer. What is the importance of defibrillator machine? Discuss the lithotripsy system with diagram. [8]
4. a) Explain the principles involved in process of converting non-electrical variables into electrical signals. Discuss the principle of magnetic induction effect. List out 3 applications of transducers. [8]
- b) Discuss the principle of Magnetic Resonance Imaging System. Explain the function of Image Detection System of NMR. List out the clinical application of MRI. [8]
5. Write short notes on: (any two) [2×8]
 - i) MAN-Instrumentation System
 - ii) Leakage Current
 - iii) Ultrasound
 - iv) EMG Recording Technique

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Exam.	Regular / Back		
	Level	BE	Full Marks
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Biomedical Instrumentation (Elective I) (EX72503)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. a) Explain man-instrument system with its five objectives. What are the most indispensable system components required for man-instrument system to transmit an ECG and HR signals of a patient who is being medically evaluated to the better center after some serious accident at a remote place? Complete a schematic lay-out diagram showing the information flow between a mobile unit and a base unit. [8]
- b) What is ventricular fibrillation? Is it caused by physiological effects of electric current than how? Give some reasons. Design a DC Defibrillator machine to restore the normal cardiac rhythm and explain its function briefly. [8]
2. a) How a transmitter circuit discharges a capacitor through the crystal of a piezo-electric transducer to generate large amplitude of pulses? How these pulses are utilized to view internal structures of the human body? Compare A-mode and b-mode display format. [8]
- b) Describe electrode theory. Draw an equivalent circuit of both electrode and transducer. What type of transducer is used in ultrasonic bloodflow meter? Explain its function with necessary diagram. [8]
3. a) What is Computer Tomography? How 'profiles are acquired for better resolution in image reconstruction technique in CT? Explain with schematic block diagram. What are the differences between CT and X-ray machine? Explain some biological effects of x-rays. [10]
- b) Draw a set of 12 leads ECG recording configuration with proper connection diagram. What types of electrodes are used to record ECG? [6]
4. a) How dialgrate fluid is used with RO water in mixing chamber to artificial kidney during dialysis? Draw a lay-out diagram of Electro-Hydraulic based ESWL with its required major components. [8]
- b) What are the system components of MRI? Explain Image Detection system with its function and application. Give four differences of MRI with CT-scan machine. [8]
5. a) What is leakage currents? How a Heart patient who is under catheferization procedure is protected from the leakage current? Assume the values of leakage current and patient resistance with suitable ground wire for proper grounding. [8]
- b) Write short notes on: (Any two) [4+4]
 - (i) Resting and Action Potentials
 - (ii) EEG Recorder
 - (iii) Electromyography

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2079 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Advanced Java Programming (Elective I)(CT72501)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt All questions.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Assume suitable data if necessary.*

1. What is an event and how it is handled in Java? Explain user interface components. [3+4]
2. Explain how applets are used in Java, associate the advantages of applets. [4+3]
3. What is object stream and serialization explain with code. [7]
4. What is parsing an XML documents? How it is done in Java? [2+3]
5. What is interruptible sockets in Java? How can you establish URL connection? [7]
6. Explain JDBC driver types in Java. Explain scrollable and updateable sets. [6+4]
7. What is Remote Object Activation? Explain the architecture of RMI. [2+3]
8. How is Swing different from AWT? Explain with example. [8]
9. What is Java Beans? Explain the naming patterns and properties of Java Beans. [3+4]
10. What is Encryption? Explain authentication and authorization with its importance. [2+5]
11. Write notes on: [2×5]
 - a) Java as Architecture Neutral
 - b) LDAP

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Exam.	Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Advanced Java Programming (Elective I) (CT72501)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. What is an event and how it is handled in Java? Explain with sample code. [3+4]
2. Explain how Applets are used in Java, associate the advantages of Applets. [4+3]
3. What is serialization and deserialization? Explain with code. [7]
4. What is XML validation? How it is done in Java? [2+3]
5. What is socket in Java networking? Explain socket timeouts. [7]
6. Explain JDBC driver types in Java. How are SQL statements executed in Java? [6+4]
7. What is RMI? Explain the architecture of RMI. [2+3]
8. How is swing different from AWT? Explain with example. [8]
9. What is Java Beans? Explain the significance of Java Beans. [3+4]
10. What is Digital Signature? Explain authentication and authorization with its importance. [2+5]
11. Write short notes on: [2×5]
 - a) Java as Architecture Neutral
 - b) Scrollable and updateable

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2078 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Advanced Java Programming (Elective I)(CT 72501)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Why is Java called Architectural Neutral? [6]
2. What is Event and how it handled in Java? Explain with sample code. [8]
3. What is Applet? Describe applet life cycle. [8]
4. Write a program on serialization and deserialization, explain with sample code. [8]
5. Differentiate DOM and SAX parser in XML parsing. [8]
6. Write complete Java code to communicate between two programs in network using sockets. [8]
7. Describe JCB architecture and JCB driver types in detail. [4+6]
8. Describe the role of stub and skeleton in Remote Method Call. [8]
9. How SWING is different form AWT? Explain the examples. [8]
10. What are Java Beans? Discuss the significant of Java Beans. [8]

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2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Advanced Java Programming (Elective I) (CT72501)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ **Attempt All questions.**
- ✓ **The figures in the margin indicate Full Marks.**
- ✓ **Assume suitable data if necessary.**

1. What are the features that make Java an object oriented programming language? Write the history of Java. [2+4]
2. What is an event and how it is handled in Java. Explain with a sample code. [3+4]
3. What is an Applet? Describe an Applets lifecycle. [5+2]
4. Write a program to illustrate object deserialization in java. How is file management done in Java? Explain with suitable example. [4+3]
5. Write a program to illustrate the SAX parser. [5]
6. What is socket in java networking? Explain Socket Timeouts. [7]
7. What are the types of JDBC drivers? Write a simple program to execute SQL statement in java. [6+4]
8. Describe the role of Stub and Skeleton in Remote method call. [6]
9. How is Swing different from AWT? Explain with example. [9]
10. What is Java Beans? Explain the different properties of java bean. [6]
11. Write short notes on: [2×5]
 - a) ByteCode Verification and necessity
 - b) Packaging Beans in JAR files
 - c) Scripting
 - d) User Authentication and Encryption

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Advanced Java Programming (Elective I) (CT72501)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What are the features that make Java an object oriented programming language? Write the history of Java. [2+4]
2. What is an event and how it is handled in Java. Explain with a sample code. [3+4]
3. What is an Applet? Describe an Applets lifecycle. [5+1]
4. Write a program to illustrate object deserialization in java. How is file management done in Java? Explain with suitable example. [4+3]
5. Write a program to illustrate the SAX parser. [5]
6. What is socket in Java networking? Explain Socket Timeouts. [7]
7. What are the types of JDBC drivers? Write a simple program to execute SQL statement in Java. [6+4]
8. Describe the role of Stub and Skeleton in Remote method call. [6]
9. How is Swing different from AWT? Explain with example. [9]
10. What is Java Beans? Explain the different properties of Java bean. [6]
11. Write short notes on: [2×5]
 - i) Byte Code verification and necessity
 - ii) Packaging Beans in JAR files
 - iii) Scripting
 - iv) User Authentication and Encryption

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Examination Control Division

2074 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Advance Java Programming (*Elective I*) (CT72501)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Why is Java a platform independent language? Write a program to use arithmetic operators in Java. [2+4]
2. Explain event handling in Java. What user interface components are used in Java? Explain. [3+4]
3. Explain how applets are used in Java with the advantages associated with applets. [5+2]
4. Write a program to illustrate object serialization in java. Explain file management in Java. [4+3]
5. Write a program to demonstrate the DOM parser. [5]
6. Write a program to illustrate socket programming in Java. [7]
7. Explain JDBC driver types in detail. What are scrollable, updatable, row and cached row sets. [6+4]
8. Explain RMI in detail. [6]
9. Explain Rendering in AWT. [9]
10. What is java beans persistence? Explain with suitable example. [6]
11. Write short notes on: (any two) [2×5]
 - i) Bytecode Verification
 - ii) Digital signature
 - iii) Bean property types

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Advanced Java Programming (Elective I) (CT72501)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. Write down the features of Java and describe shortly why Java is called platform independent. [4]
2. Why is swing preferred over AWT? Write about the GUI components. [4+3]
3. What are the disadvantages of an applet. Write about applet html tag and attributes. [4+3]
4. Write a programme to read data from a text file. [7]
5. What is XML-Schema and X-Path? [5]
6. What is an interruptable socket? Write a socket programme to connect with the server. [2+5]
7. a) What is sal? Write with sample code, how sal is executed in Java. [2+3]
b) What is cached row set? Differentiate between scrollable and non-scrollable data set. [2+4]
8. What is RMI? Compare local objects with remote objects in Java. [3+4]
9. Write on different progress indicators used in Java. Write a complete code to display some arbitrary data in a table. [4+5]
10. State Java bean properties and define them. [9]
11. Why is byte code verification necessary? Explain. [7]

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Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Web Technologies and Applications (Elective I)(CT72505)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. What is internet and web? Differentiate web1.0, web2.0 and web3.0. [3+5]
2. What is CSS? Explain its types with example. [2+6]
3. Design a webpage which contains a form where user can input name, gender, address, email and submit button to submit the form. Also validate the form using javascript. [8]
4. Write the program to connect database and insert a data using server-side scripting language [Assume database_name "employee", table_name "info" with columns id, firstname, lastname, address, post and contact]. [8]
5. Distinguish between Content Management System (CMS) and Web Application Framework. Describe the working of the MVC (Model View Controller) architecture. [3+5]
6. Explain the working principle of AJAX request and response. Explain the term wikis and blogs. [4+4]
7. Create a XML file to store information about a class on a module to record the student details where each student has roll_no, name, faculty. Display the XML Using XSLT. [4+4]
8. What is service oriented architecture? Compare SOAP and REST. [4+4]
9. What is semantice Web? Explain the semantic web component RDF and OWL. [2+6]
10. Write short notes on: (Any Two) [2×4]
 - a) Crawling
 - b) Tagging and folksonomies
 - c) RSS feed
 - d) Javascript DOM

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Exam.	Back		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Web Technologies and Applications (Elective I) (CT72505)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. Write brief history of internet and WWW. [5]
2. Design a HTML form containing text box for First Name, Last Name, Phone No, radio button for gender and checkbox for hobbies. [5]
3. What are different types of CSS and how they can be used with HTML document? [5]
4. What is Java servlet technology? What are the advantages of Java servlet over CGI? [2+4]
5. Describe the concept of multi-tier architecture with reference to web technology. [6]
6. What is Document Object Model (DOM)? Explain different document object methods to access and change the contents of HTML document. [1+5]
7. What are the key benefits of using MVC (model-View-Controller)? How MVC works? Explain. [6]
8. What is the purpose of CMS (Content Management System)? How CMS is different from web application framework? [2+3]
9. Explain the concept of web 2.0. What are the major changes in web 3.0 over web 2.0? Explain with example. [3+3]
10. Explain how AJAX request and response method works. [5]
11. Design a well formatted XML document and DTD for your XML document "MyEmployeeList" which has fields and data as given in table below. "MyEmployeeList" have data myEmployee and myEmployee consist name, contact and address, in employee list some employees are considered to be bestEmployee. [10]

my Employee			
Name		Address	
First Name	Last Name		
Chhitz	Devkota	9831000101	Jumla
Narmada	Gaudel	9831000102	Humla
bestEmployee			
Balkrishna	Rokaya	9831000103	Parbat

12. Define service-oriented architecture. Describe HTTP methods that are supported by REST architectural style for communication between client and server application. [1+5]
13. What is semantic web and what is its purpose? What are the roles of RDF and OWL in semantic web? Explain with example. [3+6]

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Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Web Technologies and Applications (Elective I)(CT 72505)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What is Internet and Web? Explain the importance of Web Technology. [4+4]
2. Design HTML User Registration form as below. Validate the registration form using JavaScript. [10]

User Registration Form

Name

Email

Gender Male Female

Phone

Country ▼

Description

3. What do you mean by Server side processing? Explain Multitier architecture? [4+4]
4. Explain Dialogue Boxes in JavaScript? [6]
5. What is Content Management system? Explain Web application framework. [3+5]
6. Differentiate Web 2.0 and Web 3.0? Why Tagging-folksonomies are important? [4+4]
7. Define XML and XSLT. Explain with appropriate example. [10]
8. Explain Service Oriented Architecture (SOA). Differentiate SOAP and REST? [6+4]
9. What is semantic web? Explain the purpose of semantic web with suitable example. [6]
10. Write short notes on: (Any Two) [2×3]
 - a) Crawling
 - b) AJAX
 - c) DOM
 - d) RDF

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Web Technologies and Applications (Elective I) (CT72505)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. Define XML? Design well formed XML document for "Student". Student should have data such as Name, Address, Phone and Email. Name should contain FirstName and LastName. Also write the DTD (Document Type Definition) for your XML document. [2+8]
2. Design a HTML User Registration form as below. [10]

User Registration Form

Name	<input type="text"/>
Email	<input type="text"/>
Gender	<input checked="" type="radio"/> Male <input type="radio"/> Female
Phone	<input type="text"/>
Interest	<input type="text"/>
	<input type="button" value="Register"/>

Validate the registration form using JavaScript. Validation should be as:

- i. All fields are compulsory.
 - ii. Name should be all characters
 - iii. Phone should be all numbers
 - iv. Validate email format
 - v. Interest should be in between 20 to 1000 characters.
3. How internet evolved? Explain the importance of web technology. [4+4]
 4. What is Document Object Model (DOM)? Explain on the basis of HTML/Java Script. [6]
 5. Define web architecture with its importance. Explain the components of web-tier architecture. [2+2+4]
 6. What do you mean by client-side and server side processing? Explain with example. [7]
 7. Define Web 2.0? Explain Web 2.0 tools Blogging and Social Networking. [2+6]
 8. What is MVC (Model-View-Controller)? Explain the need and use of MVC in web application framework. [2+6]
 9. What is semantic web? Explain the purpose of semantic web with suitable example. [6]
 10. Write short notes: (Any three) [3×3]
 - a) SOAP (Simple Object Access Protocol)
 - b) AJAX (Asynchronous JavaScript and XML)
 - c) REST (Representational State Transfer)
 - d) FTP (File Transfer Protocol)

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Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Aeronautical Telecommunication (Elective I)(EX 72504)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ All questions carry equal marks.
- ✓ Assume suitable data if necessary.

1. a) Explain what is AFTN and how it helps for the Air Traffic Management?
b) What is ICAO? Explain its function in your own words.
2. a) Why pilot do not prefer NDB as a primary navigational aid? Explain briefly.
b) Describe briefly how pilots find directional information using a DVOR.
3. a) Explain the working principle of a DME with a suitable block diagram.
b) Describe how an ILS helps the pilots to land the aircraft in poor visibility conditions?
4. a) With a suitable block diagram, explain the working principle of a primary surveillance radar.
b) In your opinion what are the advantages of secondary radar (SSR) over primary radar (ASR).
5. Write short notes on: (Any Two)
 - a) Global Navigation satellite system (GNSS)
 - b) International Telecommunication Union (ITU)
 - c) CVR and FDR

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Image Processing and Pattern Recognition (Elective I)(CT 72504)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. a) What is digital image and how it can be represented in computer? [4]
b) What do you mean by visual perception? Explain various types of visual perception. [4]
2. a) How can you classify image enhancement? What is image enhancement by point processing? Explain some of the point processing techniques. [6]
b) Explain the following terms: [2×4]
(i) Averaging filter and image subtraction filter
(ii) Zooming by replication and interpolation
3. a) Explain properties of Hadamard transformation and process of constructing Hadamard matrix. [4]
b) Why do we need frequency analysis? Explain how frequency transformation is performed using FFT. [4]
4. a) Why it is necessary to compress the image? Explain various redundancies present in the image. [4]
b) Encode the given string by using LZW encoding technique "this is the thing". [3]
5. a) What is pattern and pattern classes? Point out various pattern arrangement used in pattern recognition. [4]
b) Why do we need to extract the features of an image? Describe the various types features extraction. [4]
6. a) Define the following: [2×2]
(i) Crack and chain code
(ii) Shape number
b) What do you mean by template matching? How can we use correlation for template matching? [4]
7. a) What is the application of Edge detection filter? Explain the Robert, Prewitt and Sobel filter for edge detection. [6]
b) What do you mean by segmentation? Explain basic techniques for global thresholding. [4]
8. a) Segment the given by using region growing method for the gray level 7 with threshold value $|T| = 4$. [4]

5	6	6	6	2	2
6	4	4	4	2	2
6	5	5	5	5	1
5	1	4	4	3	1
0	1	4	3	2	1
0	2	4	2	2	0

- b) Why do we need frequency domain analysis? Explain the steps for filtering in frequency domain with suitable diagram. [5]
9. a) Explain Butterworth low pass and high pass filter. [4]
b) Differentiate between Hopfield network and hamming network. [4]

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Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Radar Technology (Elective I) (EX 72501)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
 - ✓ Attempt All questions.
 - ✓ All questions carry equal marks.
 - ✓ Assume suitable data if necessary.
1. Derive and compare the basic radar range equation of operational pulsed radar used to detect a point and a distributed target.
 2. Describe how MTI radar works with the help of block diagram and required equation. Assume that the moving target echo is masked by a side-lobe echo returned from a high-raised building.
 3. Prepare suitable specifications of powerful operational radar that can be used to detect bird migration.
 4. Explain all radar parameters with the help of both mono-static and bi-static geometries.
 5. Explain how CW radar can be modified to FM-CW radar.
 6. Classify radar systems from different aspects.
 7. A radar operating at 10 GHz, has a maximum range of 45km for an output power of 300 kW and an antenna gain of 3800. If the MDS is 10^{-12} W, then determine the minimum RCS of the target that can be determined by that radar.
 8. Write short notes on: (Any Two)
 - a) Radar Displays
 - b) Non-zero Doppler Shift
 - c) Multiple Delay line Cancellers

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Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Enterprise Computing (Elective I)(CT72507)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. Define enterprise computing. Briefly explain about the information systems that are used by function units of an enterprise. [2+6]
2. Give an overview of shift of computing paradigm. How computing paradigm is preferred in business today? Justify your argument. [4+4]
3. What is Service-Oriented Architecture(SOA) and Microservices based Architecture? Are we still using Main Frame architecture? Justify with examples. [2+2+4]
4. IOE plans to host its MIS in the cloud. As a solution Architect, you need to design a system with appropriate components (servers, databases, load balancing, monitoring and notification system e.tc.). Draw a block diagram by explaining the component that is required while deploying in the cloud. [8]
5. What are IaaS, PaaS, SaaS and the differences among these services? Clearly explain with examples the details of pros and cons of these modes of services from the perspective of solution architect. [8]
6. What is Auto Scaling? When do we use it? Explain with an architecture. List down its use cases. [2+2+3]
7. Give an overview of enterprise cloud computing ecosystem. List down its deployment model. [4+3]
8. How can we maintain security in cloud? Discuss with appropriate examples. [6]
9. An enterprise is willing to procure an ERP software but is undecided whether to host the application on premises or in the cloud. As a solution architect, make a detailed comparison of cost for hosting the ERP software on premises and in the cloud for 5 years. Provide an appropriate suggestion to the enterprise. You need list down all the factors you have considered and assumed for convincing the management. [8]
10. Write short notes on: [3×4]
 - a) Load balancing
 - b) Nepalese Government Enterprise Architecture
 - c) Enterprise Analytics
