TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

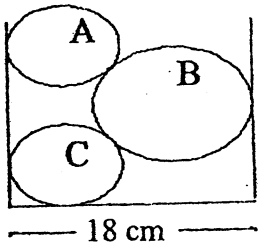
2079 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAM, BIE, BAG, BAR, BAS	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

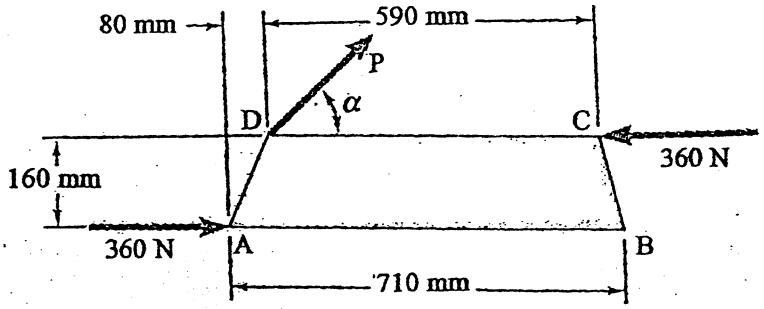
Subject: - Applied Mechanics *(CE 401)*

- ✓ 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.*

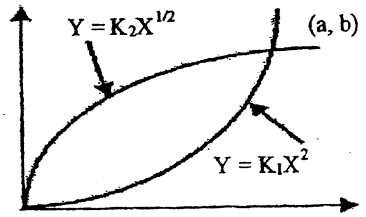
1. Explain in brief about fundamental concepts and principle of mechanics. [4]
2. Determine the reactions at the contact points, if three cylinders are piled in a rectangular ditch as shown in figure. Given that the weight of the cylinders are W_A = 3 kN, W_B = 5 kN, W_C = 3 kN respectively and radius of cylinders R_A = 4 cm, R_B = 6 cm, R_C = 4cm. Explain resolution and composition of force. [7+4]



3. A trapezoidal plate is acted upon by the force 'P' and the couple shown. Determine [4+4]
   a) the point of application on the plate of the smallest force 'F' that is equivalent to given system
   b) the magnitude and direction of 'F'

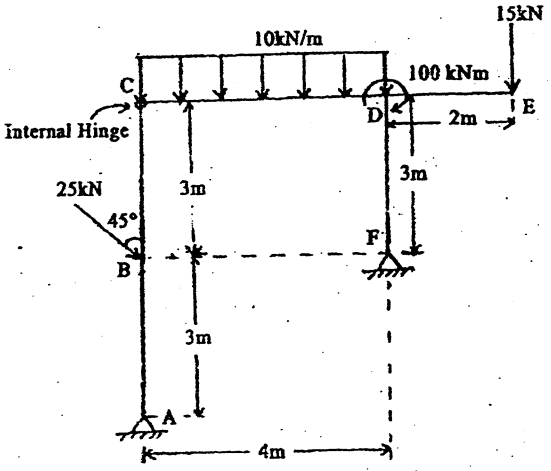


4. State and prove the parallel axis theorem for moment of inertia. Determine the moment of inertia about centroidal X-axis of given plane figure by using integration method. [4+8]

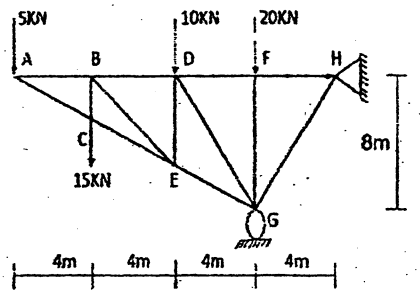


5. What is impending motion? Explain why coefficient of static friction is always greater than that of the kinetic friction coefficient? [2+2]

6. Draw axial force, shear force and bending moment diagram for the given frame. Also indicate salient features if any: [13]



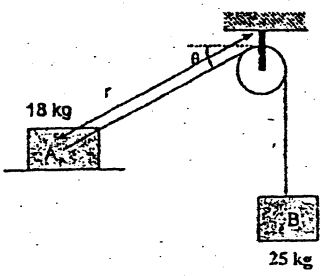
7. Determine the member force in member BE, BD, FG and EG of given loaded truss. [8]



8. Explain about dependent motion of particles with suitable example. The acceleration of a particle is defined by the relation $a = kt - 4$. Knowing that $v = 4m/s$ when $t = 2s$ and $v = -1m/s$ when $t = 1s$. Determine the value of constant k and write the equations of motion when $x = 0$ at $t = 3s$. [2+8]

9. Explain angular momentum and rate of change of angular momentum. The velocity of the block A is 2 m/sec to the right at the instant when $r = 0.73$ and $\theta = 30°$. Neglecting mass of the pulley and effect of friction, determine at this instant. [2+8]

(i) tension in the cable
(ii) acceleration of block A
(iii)acceleration of block B



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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2076 Chaitra

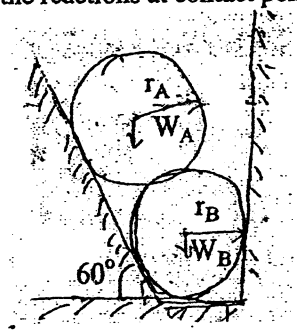
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BEI, BCT, BAM, BIE, BAG, BAR, BAS	Pass Marks	32
Year / Part	1 / I	Time	3 hrs.

Subject: - Applied Mechanics *(CE 401)*

- ✓ 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.*

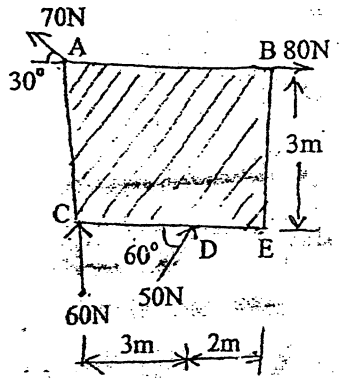
1. What are the equations of static equilibrium for 2D and 3D analysis of particle and rigid body? Define free body diagram with examples. [4+2]

2. Find the reactions at contact points of Ball A and Ball B. [7]

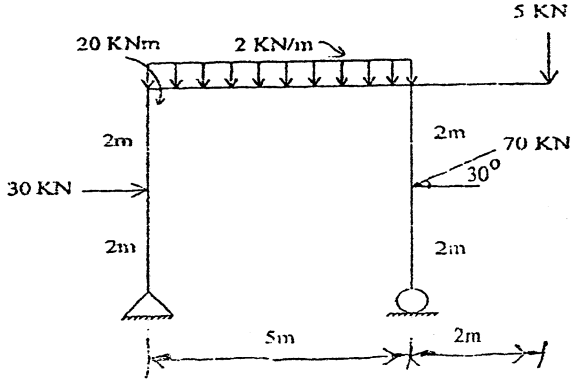


$W_A = 50N$, $W_B = 40N$
$r_A = 10cm$, $r_B = 8cm$

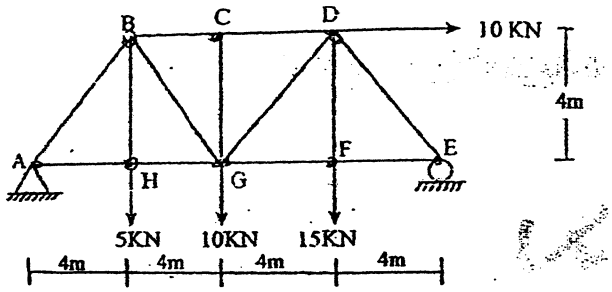
3. Define Applied Mechanics and concept of rigid & deformed body. Find the magnitude, direction and line of action of the resultant force as shown in figure below. [2+7]



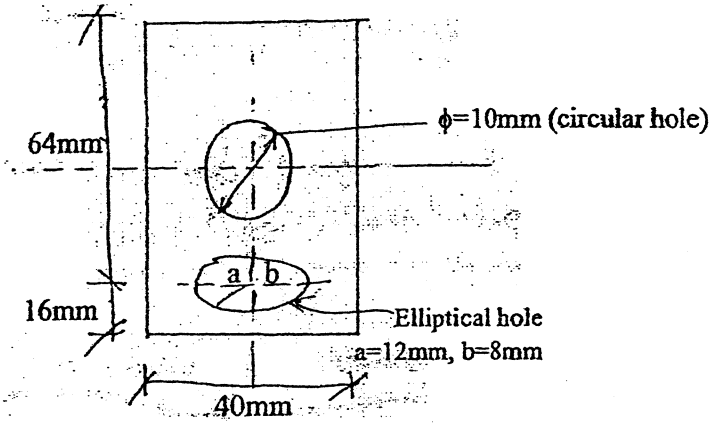
4. What do you mean by determinate and indeterminate structures? Draw AFD, SFD and BMD of the given frame loaded as shown in figure. Indicate the salient features if any. [2+12]



5. Calculate the force developed in member BC, BG, HG and GD of the truss loaded as shown in figure. Define determinate, stable, unstable structures. [5+2]



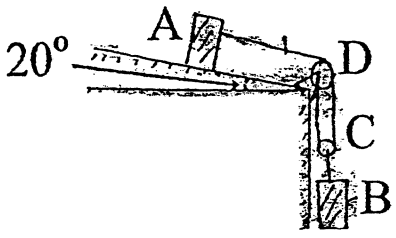
6. Find MOI about Centroidal XX and YY axes of the composite area. Define Centroid, Center of Gravity and axis of symmetry. [8+4]



7. What do you mean by friction? What are the laws of dry friction? Explain about static and kinetic friction. [1+2+2]

8. Define Kinematics and Kinetics of particle. A train runs at a speed of 120km/hr in a curved track of radius 900m the application of brake suddenly, causes the train to slow down at a constant rate. After 6 seconds the speed has been reduced to 72km/hr. Determine the acceleration immediately after the brakes is applied. [2+8]

9. Determine the acceleration of two block & tension in the wire when two blocks start form rest. There is no friction & no mass of pully. Coeff. of kinetic friction is 0.4 and m_A=100kg and m_B=300kg. What do you mean by impulse momentum principle and dynamic equilibrium? [7+3]



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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAM, BIE, BAG, BAE, BAS	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Applied Mechanics *(CE 401)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt All questions.*
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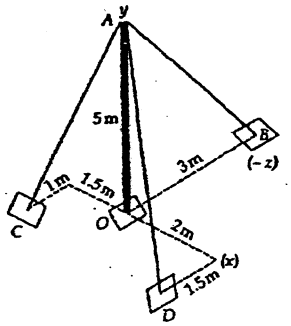
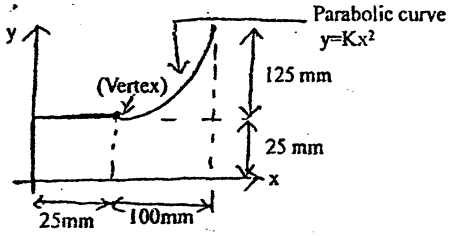
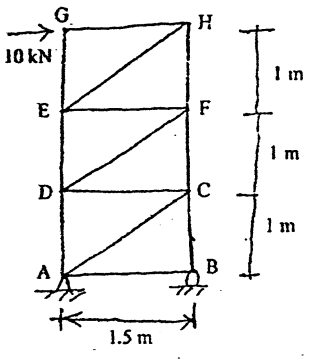
1. Define the terms Rigid body and particles. [2]
2. What do you understand by Free Body Diagram? Explain with sketches. What is the physical significance of static equilibrium? [4+4+2]
3. In the system shown in figure, a 5m long pole is held in vertical position by three guy wires AB, AC and AD. If the tension of 600 N is induced in AD and the resultant force at A is to be vertical, determine the tension in cables AB and AC. [8]



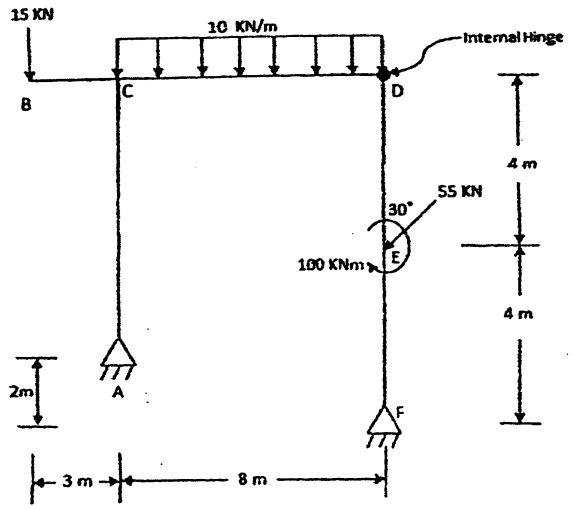
4. What are the characteristics of couple? [4]
5. What are the uses of friction in engineering field? [2]
6. Determine the centroid of the following composite figure. [10]



7. Analyze the following pin-jointed frame regarding the members AD, DC, DF, ED and FC, using Method of Moment. [10]



8. Draw axial force, shear force and bending moment diagram of the given frame. Indicate salient features if any. [14]

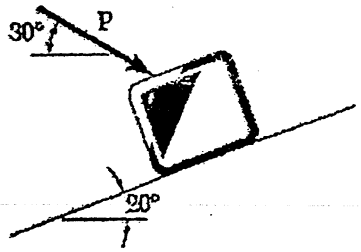


9. What do you mean by dependent motion, explain with example? [2+8]

A projectile is fired from the top of a 30 m high building with an initial velocity of 45 m/s at an angle of 35° with the horizontal. Neglecting air resistance, find

a) the greatest elevation above the ground,
b) the horizontal distance from the point of projection to the point where the projectile strikes the ground
c) the velocity with which it strikes

10. Define principle of impulse momentum for particle. A 20-kg package is at rest on an incline when a force P is applied to it. Determine the magnitude of P if 10 s is required for the package to travel 5 m up the incline. The kinetic coefficients of friction between the package and the incline is equal to 0.3. [2+8]



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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAM, BIE, BAG, BAE, BAS	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Applied Mechanics *(CE 401)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
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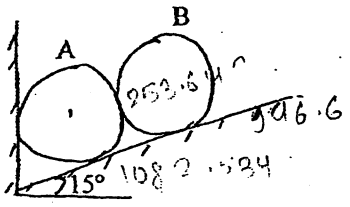
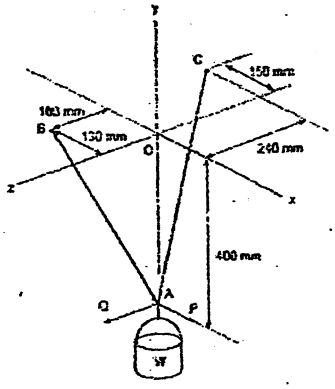
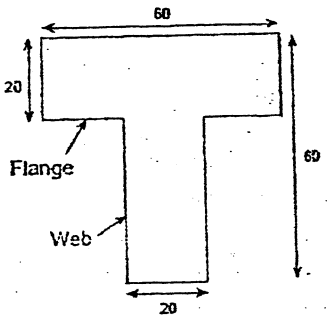
1. Differentiate between particle and rigid body. [2]
2. Determine the forces developed on the contact surfaces of the following body. Neglect the effect of friction. Given: Mass of body A = Mass of body B = 100 kg
   Dimensions of body A = Dimension of body B [9]



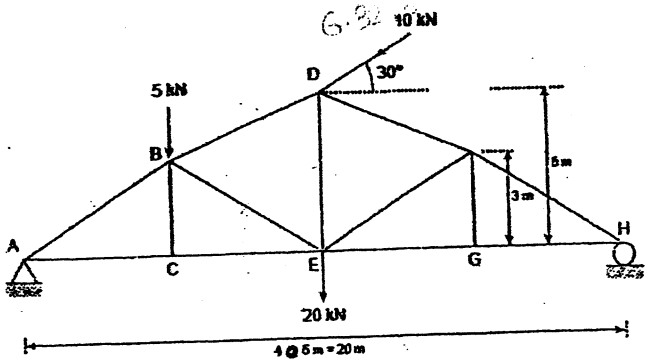
3. A container of weight W is suspended from ring A. Cable BAC passes through the ring and is attached to fixed supports at B and C. Two forces P = Pi and Q = Qk are applied to the ring to maintain the container in the position shown. Knowing that W = 376 N, determine P and Q. [7]



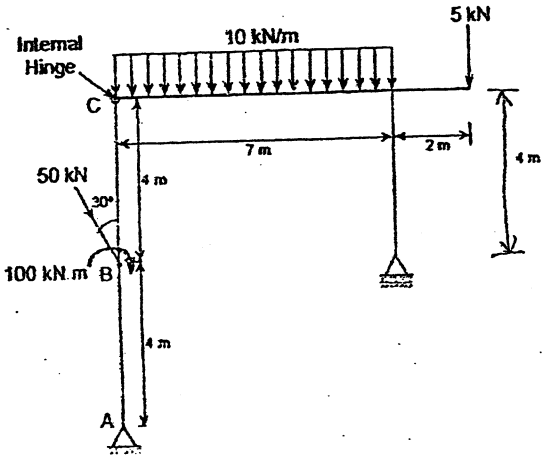
4. State and prove varignon's theorem. [4]
5. Define the angle of friction, impending motion and condition of tipping and sliding of block. [4]
6. Calculate the MOI about centroidal axes. All dimensions in cm. [10]



7. Determine the member force in AB, CE, BE, ED and BD for given truss. [10]



8. Draw AFD, SFD and BMD for the beam loaded as shown in figure. Also show the salient point (if any). [14]

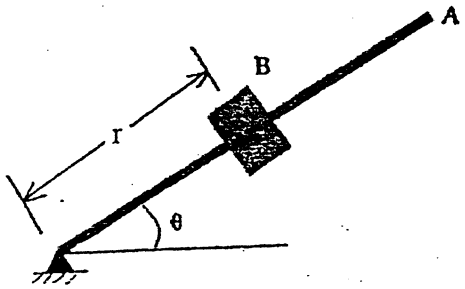


9. Define tangential and normal component of acceleration. The motion of particle is given by the relation $v_x = 2 \cos t$ and $v_y = \sin t$. It is known that initially both x and y coordinate are zero. Determine

   a) Total acceleration at the instant of 2 sec
   b) The equation of path [2+8]

10. What do you mean by the principle of impulse and momentum? The motion of a 1000 gm block B in a horizontal plane is defined by the relations $r = 3(1+\sin 2\pi t)$ and $\theta = 2\pi t$, where r is expressed in metres, t in seconds and θ in radians. Determine the radial and transverse components of the force exerted on the block when [2+8]

    a) $t = 0$ and
    b) $t = 0.5$ sec.



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21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2074 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BAME, BCT, BIE, B.Agri., B.Arch.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Applied Mechanics *(CE401)*

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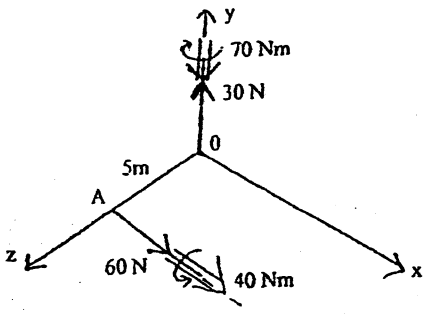
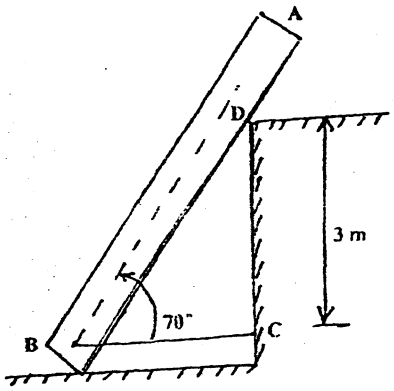
- ✓ *Assume suitable data if necessary.*

1. Define Equilibrium and its essence. What are the equations of static equilibrium for 2D and 3D analysis of particle and Rigid Body? [6]

2. Replace the two wrenches as shown in figure below by a single equivalent wrench and determine the point where its axis intersects the XZ plane. [8]



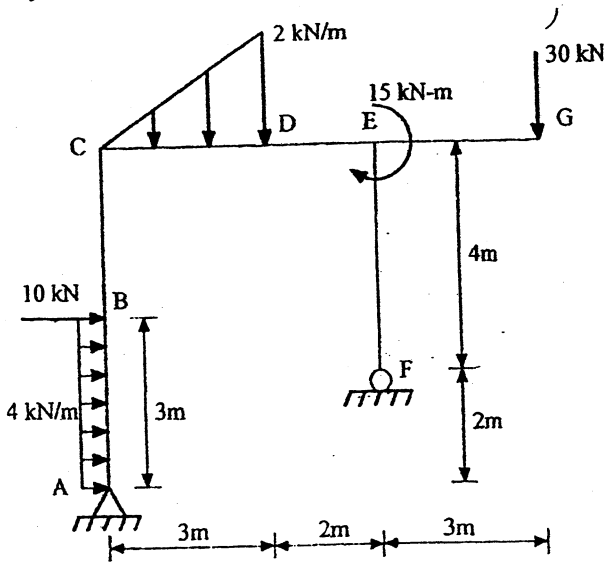
3. Determine the tension in the cable BC which holds a part AB of length 4m length from sliding. The past has a mass of 10 kg. Assume all the contact surfaces are smooth. [6]



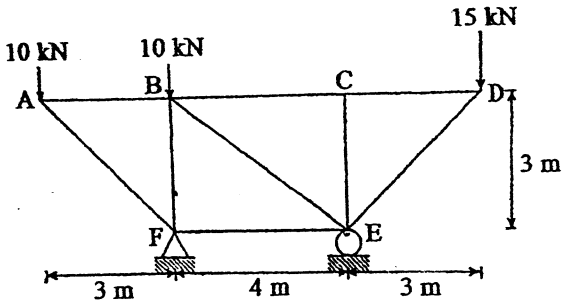
4. Illustrates the conditions of no friction, no motion, impending motion and motion with necessary sketches. How can you assure condition of sliding or overturning of the block? [3+2]

5. "The four different situation that can occur when a rigid body is in contact with a horizontal surface having coefficient of static and kinetic fiction as μ_s and μ_K respectively are: a) No friction, b) No motion, c) Motion impending and d) Motion". Justify the statement with suitable example. [4]

6. Draw axial force, shear force and bending moment diagram of the given frame. Indicate salient features if any. [13]

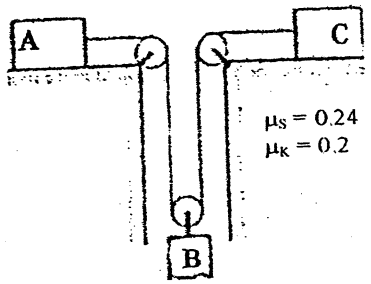


7. What are the assumptions of an ideal truss? Find the member force in the members AF, BF, BE, CE of the truss shown below. [2+6]



8. Define uniformly rectilinear motion and uniformly accelerated motion. The relation for r and θ for the motion of a particle is given by $r = \theta^3$ and $\theta = t^2$ where r is in meters, θ is in radians and t is in sec. Find the velocity and acceleration when $\theta = 0.3$ radian. [2+8]

9. Show that, "rate of change of angular momentum about a point is equal to moment of the force about same point". Three blocks A, B and C of mass 5 kg, 10 kg and 10 kg respectively are connected by rope and pulley arrangement as shown in figure. Neglecting mass of pulley, determine acceleration of each block and tension in each cable. [2+8]



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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2078 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAM, BIE, BAG, BAR, BAS	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Applied Mechanics *(CE 401)*

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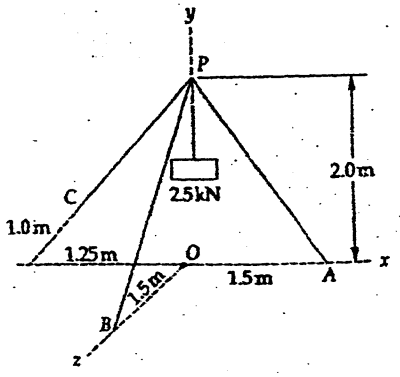
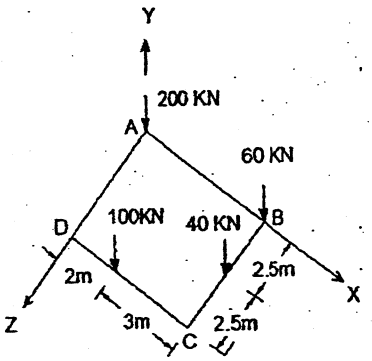
1. Explain the basic concepts used to study the condition of rest or motion of particles and rigid body under the action of force. Define transmissibility of force. [2+2]

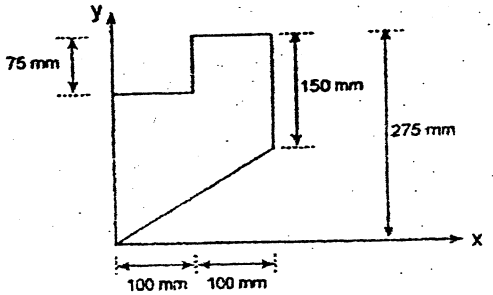
2. A tripod supports a load of 2.5 kN at point P as shown in figure. The end points A, B, C of the three legs in the x-z plane. Make calculations for the force developed in each leg. Explain free body diagram and its importance. [6+4]



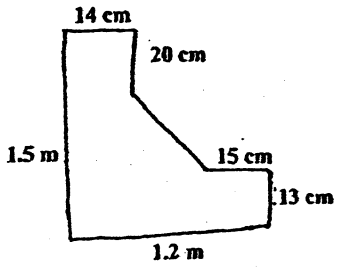
3. How does "Varignon's theorem" differ from "Principle of Moments"? Explain. Determine the magnitude and point of application of resultant for a system of force consisting of a square foundation ABCD supporting the four column loads as shown. [3+6]



4. State & prove parallel axis theorem. Calculate polar moment of inertia of the given composite area about its centroidal axis. [4+8]

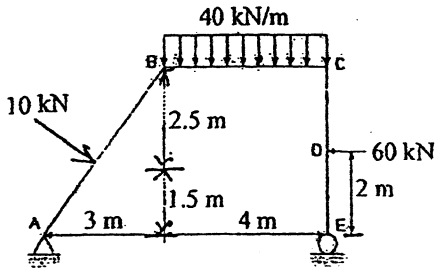


5. Determine moment of inertia about centroidal XX and XY axes of the plane figure shown in figure below. Define centroid, centre of gravity and axes of symmetry. [9+3]

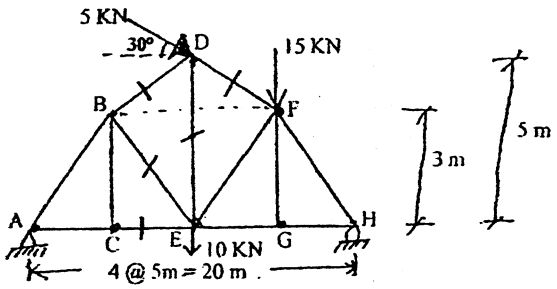


6. a) How can you check the determinacy and stability of the frame? Explain with examples. [3]

   b) Calculate and draw the axial force, shear force and bending moment diagram; with its salient features for the given frame. [12]



7. Find the member force in the indicated members of the truss shown below. [8]



8. Explain about relative motion of particle with example. A projectile is fired from position A with an initial velocity of 200 m/sec at a target B on right located 500m above from the position A. The horizontal distance between A and B is 3000 m. Determine the firing angle neglecting air resistance. [2+8]

9. The resultant external force acting on a 2 kg particle in space is $\vec{F} = \left(12t\,\hat{i} - 24t^2\,\hat{j} - 40t^3\,\hat{k}\right)$ N, where t is the time measured in seconds. The particle is at rest at the origin when t = 0. Determine the acceleration component a_y, the velocity component V_y, and the coordinate y of the particle at the instant of 4 sec. What do you mean by principle of impulse and momentum? [8+2]

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21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

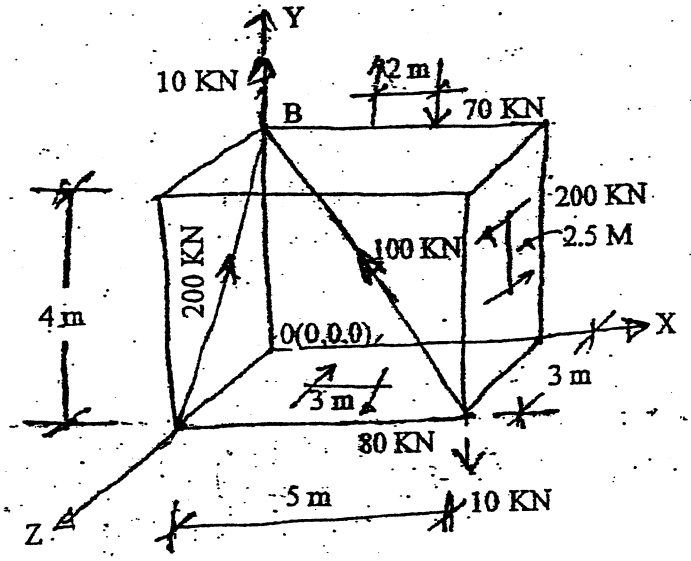
2073 Shrawan

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

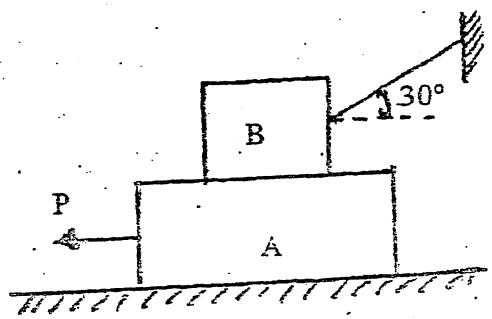
Subject: - Applied Mechanics *(CE401)*

- ✓ 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.*

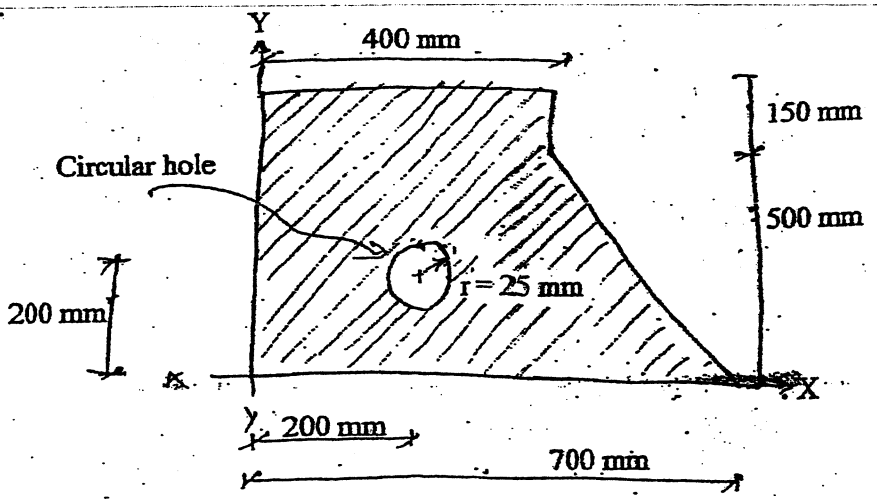
1. What do you understand by a Rigid Body? Why it is necessary to assume a body as 'perfectly rigid' for your present study? [3]
2. Write down the concept of rigid bodies and deformable bodies. What is Free Body Diagram and why it is used during analysis of structure? [8]
3. Determine the resultant force and moment of the following system about the point 'O' as shown in figure below. [10]



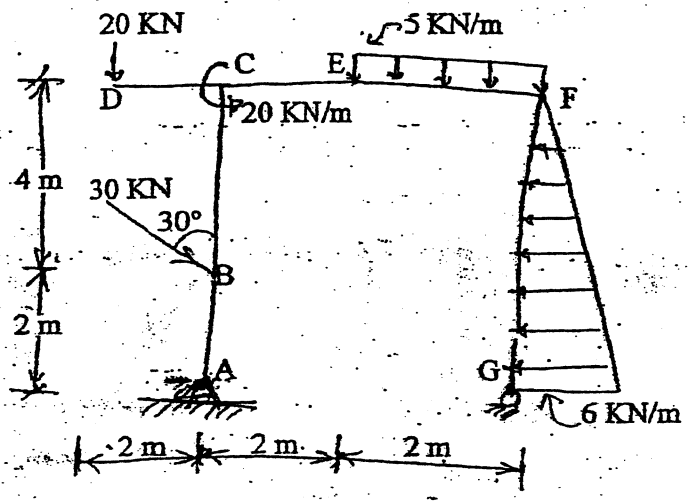
4. Two blocks A and B of 40 N and 20 N respectively are in equilibrium position as shown in figure below. Calculate the force P required to move block A. Take $\mu = 0.3$ for all surface. [5]



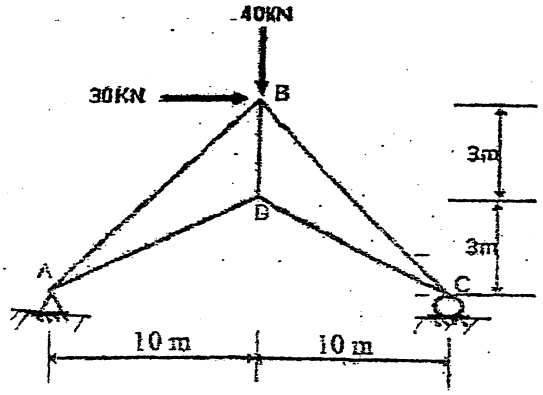
5. Calculate the moment of inertia of the composite area as shown in figure about it's centrorial axes. Define centroid, center of gravity, axis of symmetry and radius of gyration. [8+4]



6. Draw AFD, SFD and BMD for the given frame and loading. Indicate salient points, if any. [14]



7. Write down the ideal assumptions of Truss. Calculate the member forces in all members of the truss loaded as shown in figure below by using suitable method. [2+6]



8. Define the uniformly rectilinear motion and the uniformly accelerated rectilinear motion. A projectile is fired with an initial velocity of 244m/s at a target B located 610m above the gun A and at a horizontal distance of 3658m. Neglect air resistance, determine the value of the firing angle α. [2+8]
9. The motion of a 1000 gm block B in a horizontal plane is defined by radius, $r = 2(1+\cos 2\pi t)$ and $\theta = 2\pi t$ where 'r' is expressed in meters and t in seconds. Determine the radial and transverse components of the force exerted on the block B at 0.8 sec. Explain about principle of impulse and momentum. [8+2]

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21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2073 Chaitra

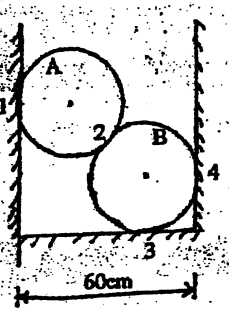
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BAME, BCT, BIE, B.Agri., B.Arch.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Applied Mechanics *(CE401)*

- ✓ 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.*

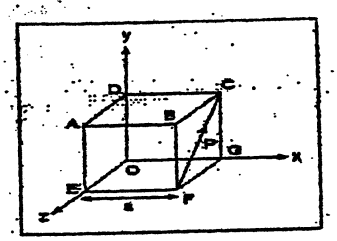
1. Enlist the fundamental principles of Applied Mechanics. Define rigid body. [3+1]

2. Two smooth spheres of weight 200N each are kept inside a channel shown in figure. The radius of each sphere is 20cm. Determine reactions at contact surfaces. [6]

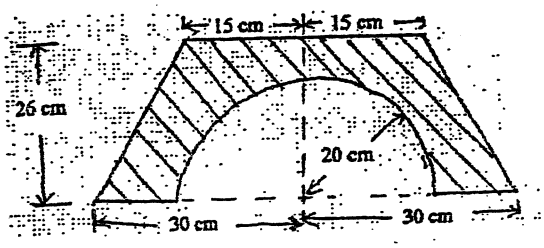


3. Define couple and show that couple is a free vector. How will you reduce a system of forces to a wrench? A cube of side a = 4m is acted upon by a force P = 20kN as shown. Determine the moment of force P. [2+3+6]

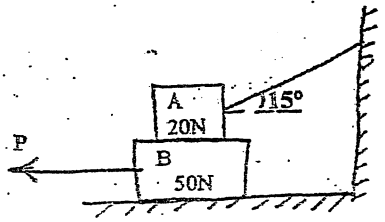
a) about A
b) about edge AB
c) about diagonal AG of cube



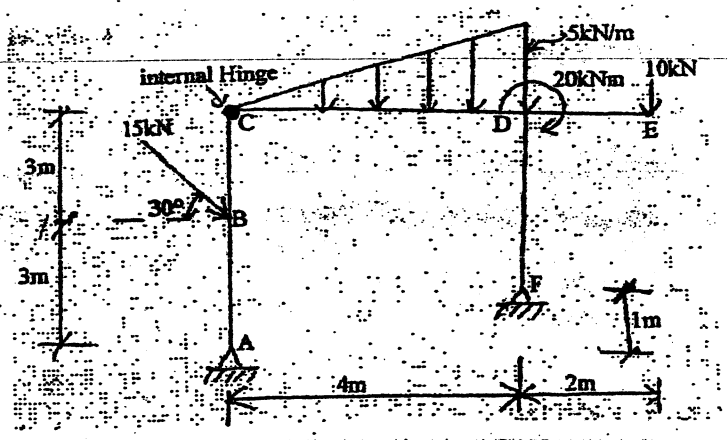
4. State parallel axis theorem and radius of gyration. Calculate the moment of inertia of the given shaded area about it's centroidal axes. [3+9]



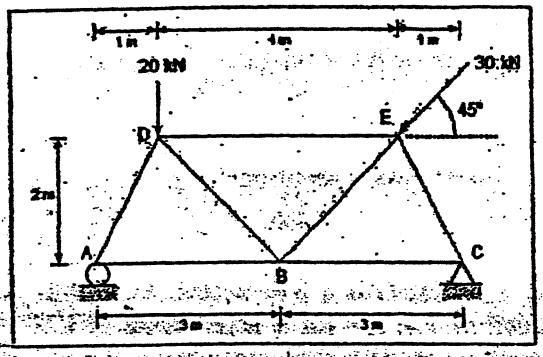
5. Determine the force required for just motion of the block B shown in figure below. Take $\mu_s = 0.25$ for all surfaces. [5]



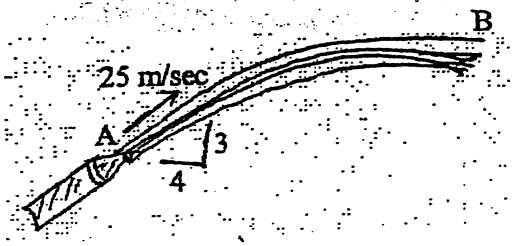
6. Draw the axial force, shear force and bending moment diagram for the given frame shown in figure below. Also show the salient features. [14]



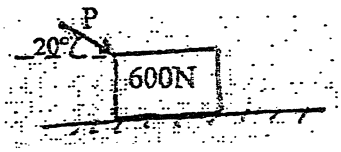
7. Determine the force developed in the members of the given truss. What are the assumptions of perfect truss? [6+2]



8. A nozzle discharges a stream of water in the direction shown below with an initial velocity of 25 m/sec. Determine the radius of curvature of the stream (a) as it leaves the nozzle, (b) at the maximum height of the stream. What do you mean by dependent motion of particle? Explain with suitable example. [8+2]



9. A 600N block rests on a horizontal plane. Find the magnitude of P required to produce the block an acceleration of $2m/s^2$ to the right. The coefficient of friction is 0.25. What do you mean by dynamic equilibrium? [8+2]



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21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

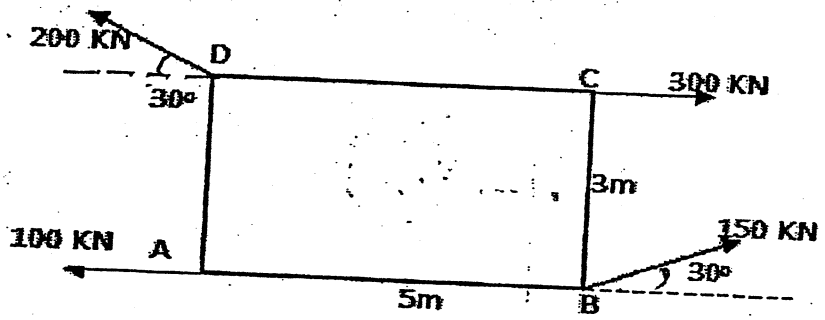
2072 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAME, BIE, B. Agri. B. Arch.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

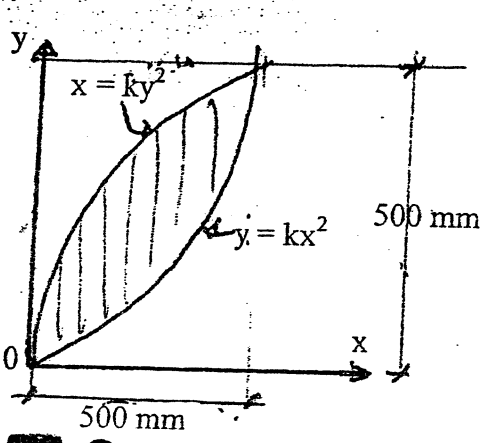
Subject: - Applied Mechanics *(CE401)*

- ✓ 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 about the fundamental principle of applied mechanics. [3]
2. Write down the steps to be considered while drawing a free body diagram. Illustrate equilibrium condition of particle and rigid body in two and three dimensional analysis. [8]
3. Find the magnitude, direction and Position of resultant force of the following system as shown in figure. [10]

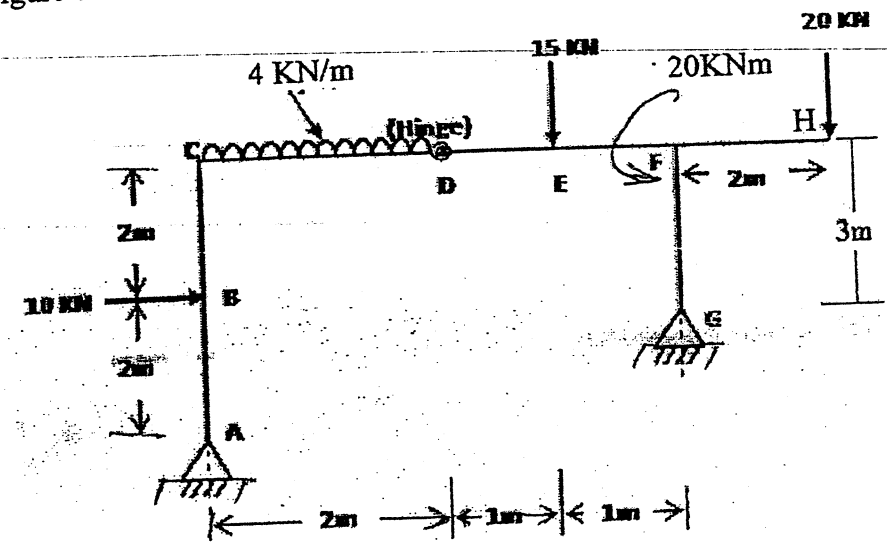


4. Describe the condition illustrating No friction, No motion, Impending motion and motion with proper sketches. How can we assure condition of sliding and over turning of a block? Explain with suitable figure. [3+2]
5. State and prove parallel axes theorem for moment of inertia. Determine centroid of the given plane in figure below. [4+8]

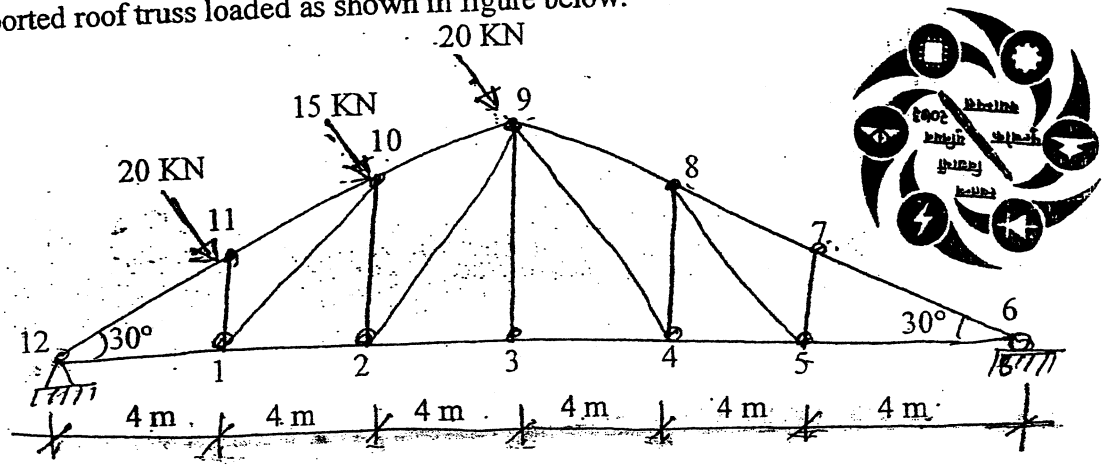


FSU-2073

6. Draw the Axial Force, Shear Force and Bending Moment diagram for the given frame shown in figure below. Also show the salient features. [14]



7. Find the member force of members 1-11, 1-10, 1-2 ,2-10 and 10-11 of the simply supported roof truss loaded as shown in figure below. [8]

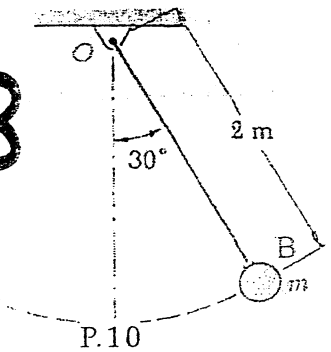


8. A ball is tossed with velocity of 10 m/s directed vertically upward from a window located 20 m above the ground. Knowing that the acceleration of the ball is constant and equal to 9.81 m/s^2 downward, determine: [8+2]

   i) The velocity 'v' and the elevation 'y' of the ball above the ground at any time 't'.
   ii) The highest elevation reached by the ball and the corresponding value of 't'.
   iii) The time when the ball will hit the ground and the corresponding velocity.

   What do you mean by dependent motion? Explain with example.

9. Define the linear momentum and angular momentum. Find the velocity and the acceleration of the bob in the given position. The bob of a 2 m pendulum describes an arc of a circle in a vertical plane, which is shown in figure below. If the tension in the cord is 2.5 times the weight of the bob for the position shown. [2+8]



FSU-2073

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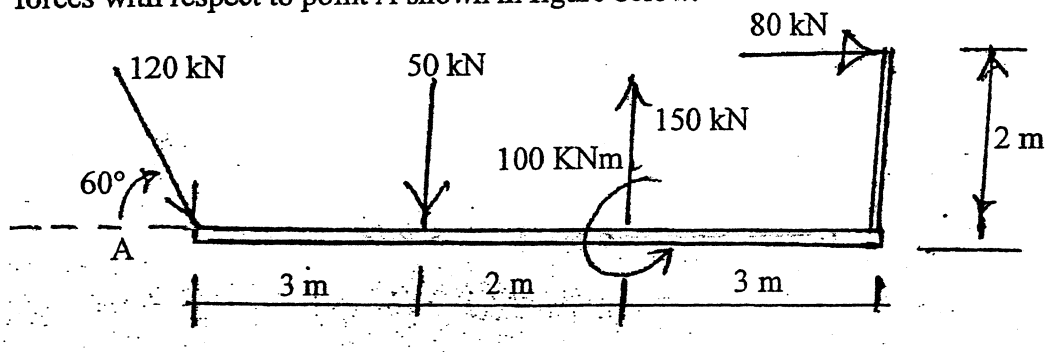
21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

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

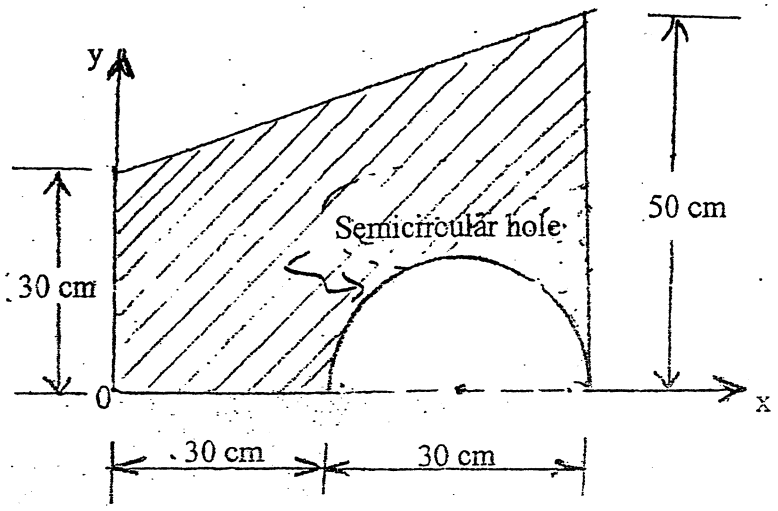
Subject: - Applied Mechanics *(CE401)*

- ✓ 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 physical meaning of equilibrium and its application in structural engineering. [4]
2. a) Differentiate between rigid body and deformable body. Also explain the free body diagram. [2+2]
   b) Determine the magnitude, direction and position of the resultant of the system of forces with respect to point A shown in figure below. [12]



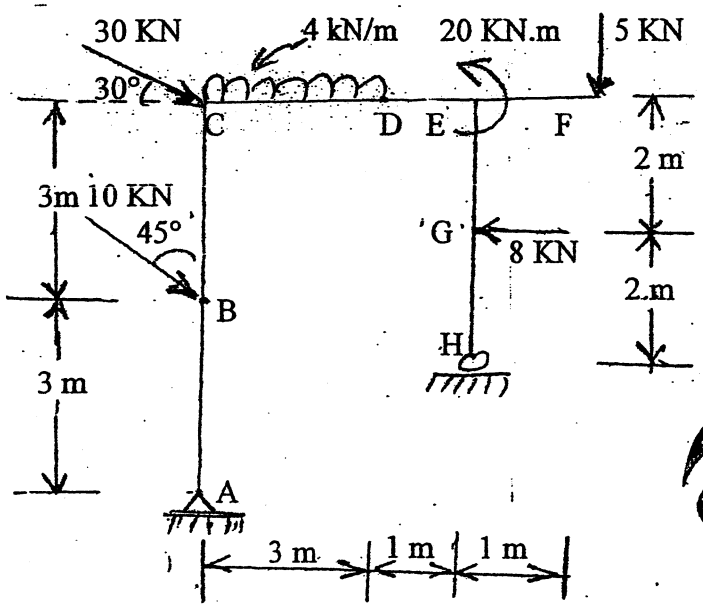
3. State and prove the parallel axis theorem for moment of inertia. Determine the moment of inertia of the given composite area as shown in figure below about it's centroidal X-X axis. [4+8]



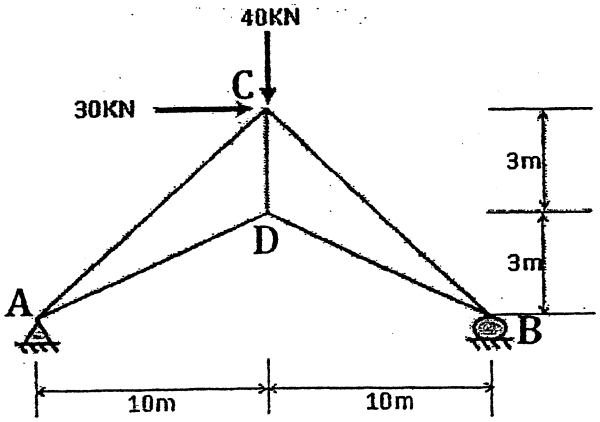
4. Define friction force and explain condition of tipping and sliding of a block. [1+3]

FSU-2073

5. Draw AFD, SFD and BMD of the given frame loaded as shown in figure below. Indicate also the salient features if any. [14]



6. Write down the ideal assumption of truss. Calculate the force developed in all members of the truss loaded as shown in figure by using suitable methods. [2+8]



7. What do you mean by dependent motion of particles? Illustrate it with suitable example. A particle starting from origin is subjected to acceleration such that $a_x = -2 m/sec^2$ and $a_y = -5 m/sec^2$. The initial velocity is 60 m/sec directed at a slope of 30° w.r.t. horizontal. Compute the radius of curvature at the end of 3 sec. Also determine its position at the end of 3 sec. [3+7]

8. Show that, "rate of change of angular momentum about a point is equal to moment of the force about the same point." The resultant external force acting on a 5 kg particle in space is $\vec{F} = (12t\hat{i} - 24t^2\hat{j} + 40t^3\hat{k})$ N, where t is seconds. The particle is initially at rest at origin. Determine the x component of acceleration, velocity and position at the instant of 5 sec. [4+6]

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FSU - 2073

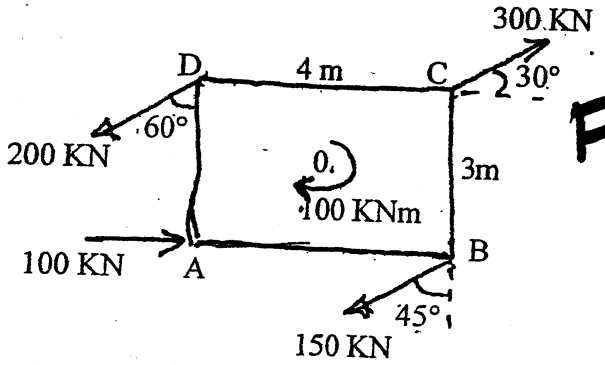
21 IBHUVAN UNIVERSITY
INST TE OF ENGINEERING
Examin ion Control Division
2071 Chaitra

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

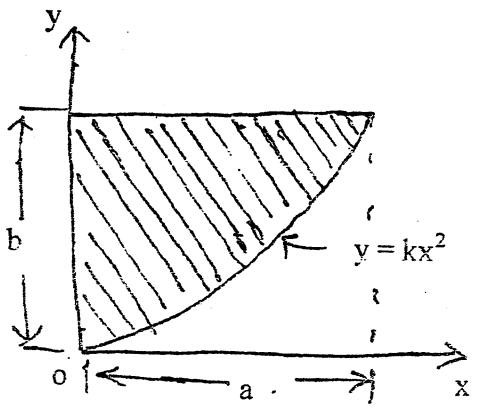
Subject: - Applied Mechanics *(CE401)*

- ✓ Cand ates are required to give their answers in their own words as far as practicable.
- ✓ *Atten* ***All questions.***
- ✓ *The f ures in the margin indicate* ***Full Marks.***
- ✓ *Assum e suitable data if necessary.*

1. Explain about the principles of Applied Mechanics. Why it is necessary to assume a solid body as 'perfectly rigid' for the study of statics? [3+3]
2. Define Free Body Diagram with example and explain about equations of static equilibrium for 2-D and 3-D analysis of a particle and a rigid body. [2+4]
3. Describe the principle of transmissibility. Determine the magnitude, direction and position with respect to center 'O' of the resultant of the forces acting on the rectangular plate ABCD as shown in figure below. [3+8]

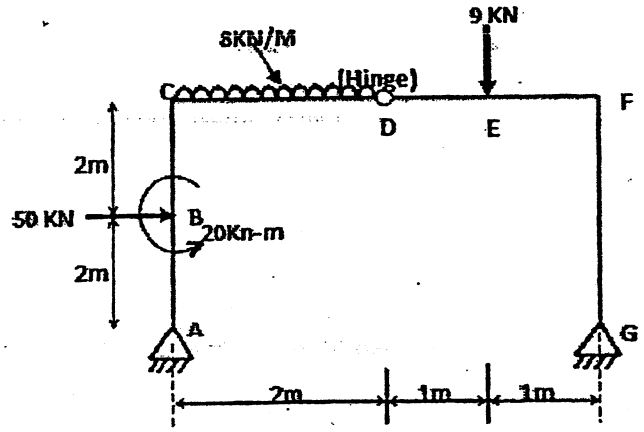


4. Explain radius of gyration. Determine the centroid of the shaded area shown in figure below, Using direct integration method. [3+8]

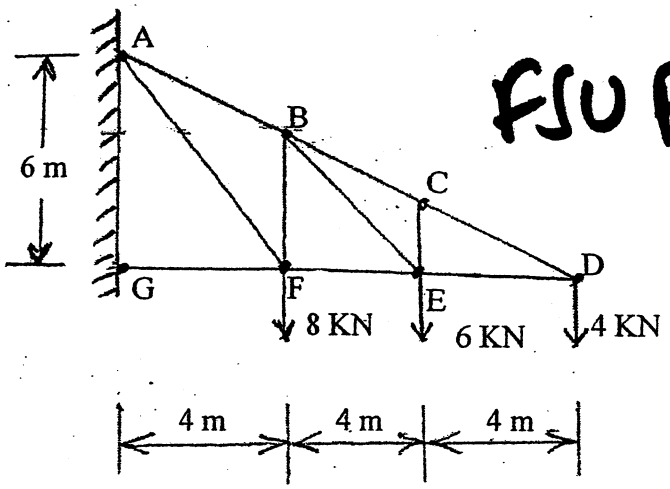


5. What are the advantages and disadvantages of friction? Also explain the working principles of high tension friction grip bots. [2+2]

6. A frame is loaded as shown in figure below. Draw the AFD, SFD and BMD and also show the salient features of each diagram. [14]



7. Describe the use of trusses in engineering. Determine the force developed in BC, BE, EF, AB, AF and BF members of cantilever truss loaded as shown in figure below. [2+6]



8. a) What is uniformly accelerated rectilinear motion? Also define the angular momentum and its rate of change. [2+2]

   b) Motion of a particle is defined by a relation $x = \frac{t^3}{3} - 3t^2 + 8t + 15$. Determine the position of particle when velocity is 2.5m/sec. Also determine the position of particle when acceleration is 3.6 m/sec^2. [6]

9. a) What are tangential and normal components of velocity? Explain with examples. [4]

   b) A particle moves along a curved path defined by $r = 4\theta^2$ and $\theta = \frac{t^2}{2}$ where r is in meters and t in seconds. Determine the velocity and acceleration of the particle when $\theta = 80°$. [6]

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21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

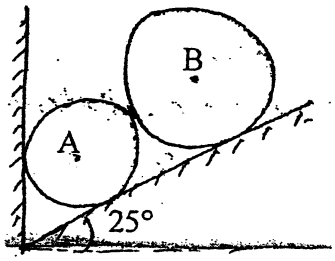
Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BIE,B.Agri,B.Arch	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Applied Mechanics *(CE401)*

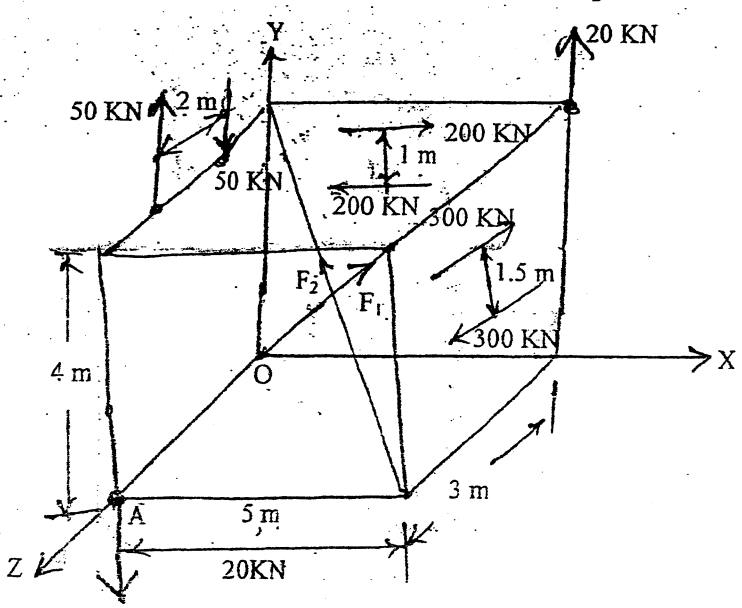
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Why it is necessary to assume a solid body as a perfectly rigid in the Engineering study. [3]

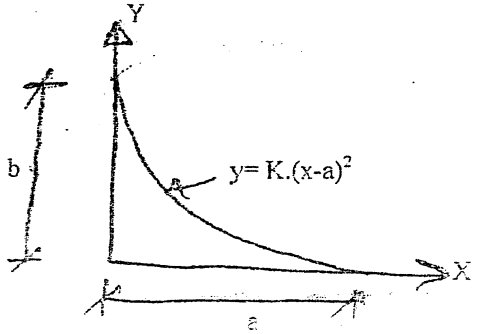
2. What is free body diagram? The cylinder A and B rest in an inclined surface which makes an angle of 25° with horizontal as shown in figure below. Determine reaction at contact points. Take: [2+6]
   Weight of cylinder A (W_A) = 100 N
   Weight of cylinder B (W_B) = 200 N
   Diameter of cylinder A (r_A) = 60 mm
   Diameter of cylinder B (r_B) = 9



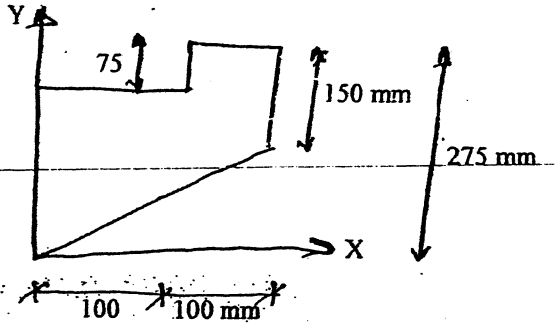
3. Find the resultant of force couple system at point 'A' as shown in figure below. Take F_1 = 100 KN, F_2 = 300 KN. Define a couple and show that couple is a free vector. [8+3]



4. Determine by direct integration method, the centroid of the area shown in figure below: [5]

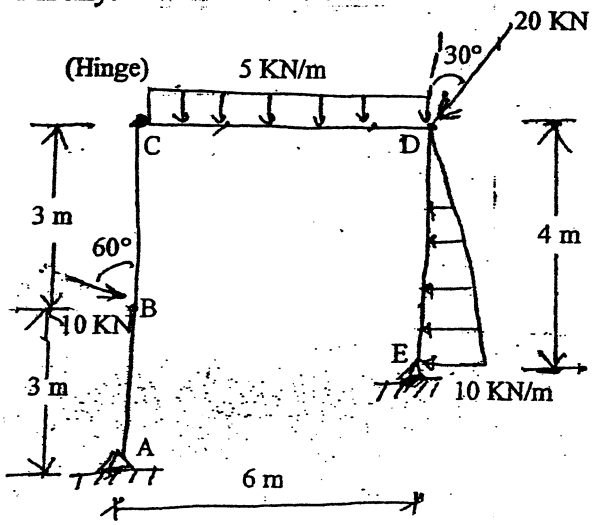


5. Calculate the moment of inertia of the composite area about Y-axis. [6]

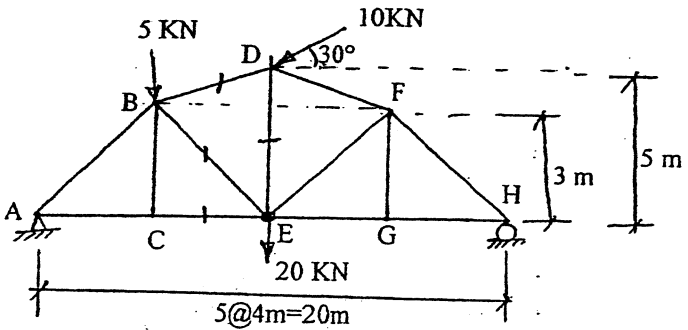


6. State laws of dry friction. How can we assume the condition of overturning and sliding of a block? Explain with suitable example. [2+3]

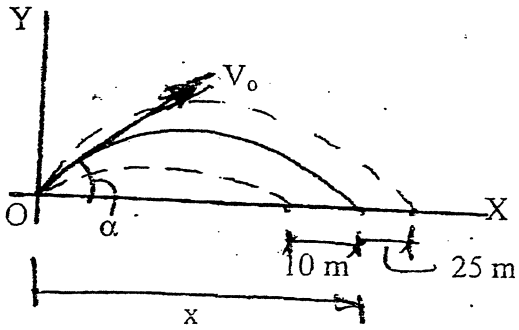
7. Draw axial force shear force and bending moment diagram for the given frame. Also indicate salient features if any. [14]



8. Find the member forces in CE, BE, BD and DE for the given truss. Define stability and determinacy of structures with examples. [5+3]



9. A projectile is aimed at a marked on the horizontal plan through the point of projection and falls 10 shorts when the angle of projection is 15° while overshoots the mark by 25 m when the inclination is 40°. Calculate the distance of the target and required angle of projection, if the velocity remains constant. Neglecting air resistance. Define dependent motion of particle with example. [8+2]



10. Define the dynamic equilibrium. Determine the velocity and acceleration of the particle, if it moves along a curved path defined by $r = 16\theta$ and $\theta = t^2/3$, where r is in meters and t is in seconds. Given that the instant angle is $\theta = \pi/2$. [2+8]

21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

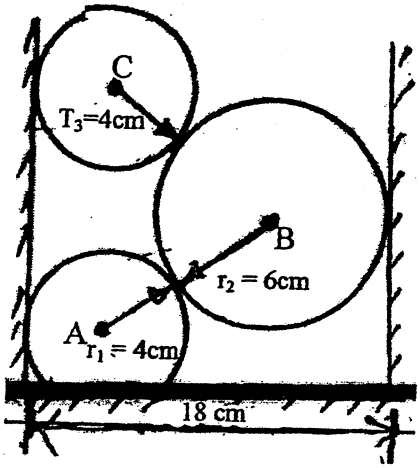
2070 Chaitra

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

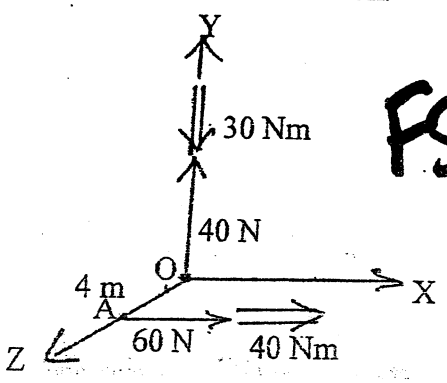
Subject: - Applied Mechanics *(CE401)*

- ✓ 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.*

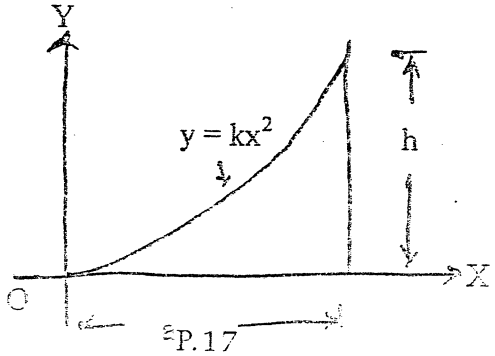
1. Describe the scope and importance of applied mechanics in engineering study. Define free body diagram with examples. [2+2]
2. Determine the reactions at the contact points, if three cylinders are piled in a rectangular ditch as shown in figure. Given that the weight of the cylinders are: $W_A = 2$ KN, $W_B = 5$ KN, $W_C = 3$ KN [8]



3. How can you reduce a force into a force and couple? Obtain the resultant of the two pairs of wrench shown in the figure. Indicate it's line of action. [3+8]

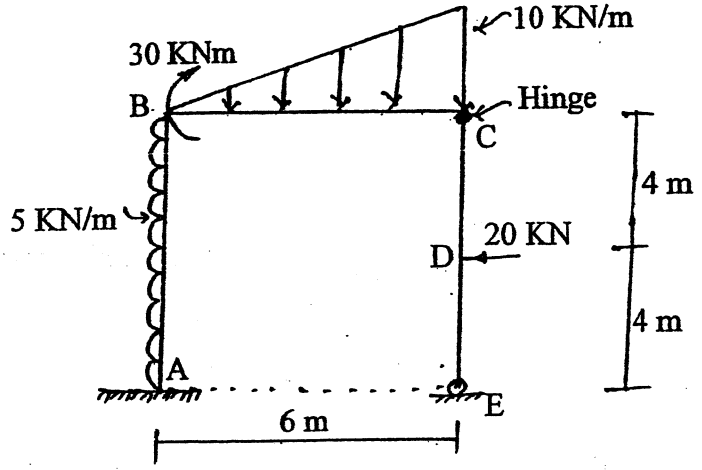


4. Determine centroid of the given plane figure. State and prove parallel axes theorem for moment of inertia. Define centroid and center of gravity. [7+3+2]

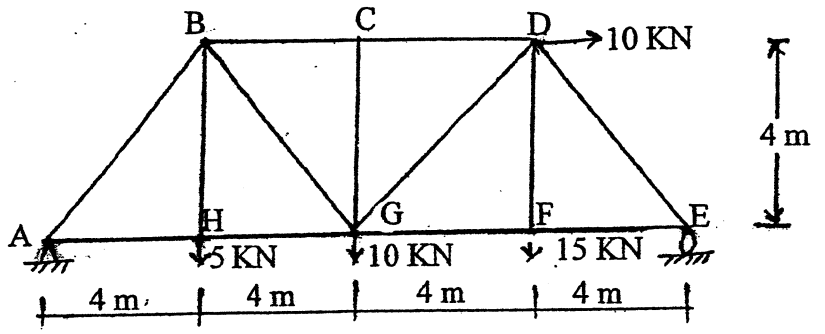


5. Define the angle of friction and also write the laws of static friction. [4]

6. Draw axial force, shear force and bending moment diagram for the loaded frame as shown in figure below. Also indicate the salient featutes if any. [13]

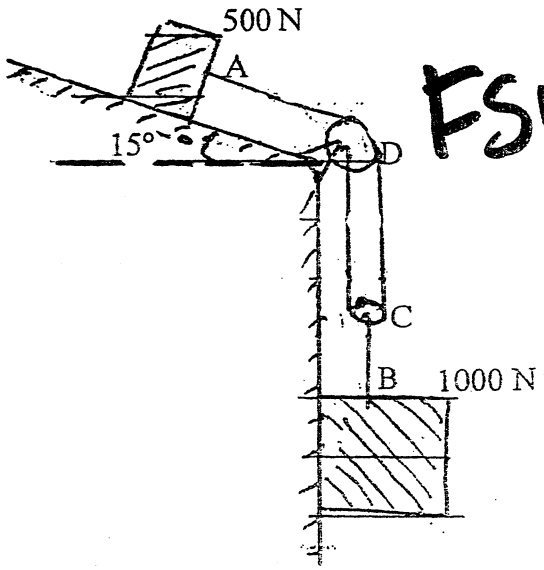


7. Determine the total degree of internal, external indeterminacy of given truss. Also determine the member forces in members BC, BG, HG and GD. [2+6]



8. The acceleration of a partial is given by a relation $a = v^3$. It is known that at time $t = 0$, position is -2m and velocity is 2m/sec. Find the displacement, position, velocity and acceleration at instant of ½ sec. What do you mean by projectile and obtain the equations for projectile motion. [7+3]

9. What do you mean by impulse momentum principle? Two blocks A and B having respective weights 500 N and 1000 N start form rest. The pulley is frictionless and also practically mass less. The kinetic coefficient of friction between the block A and the inclined surface is 0.35. Determine the acceleration of each block and tension in the cord. [2+8]



FSU PULCHOK

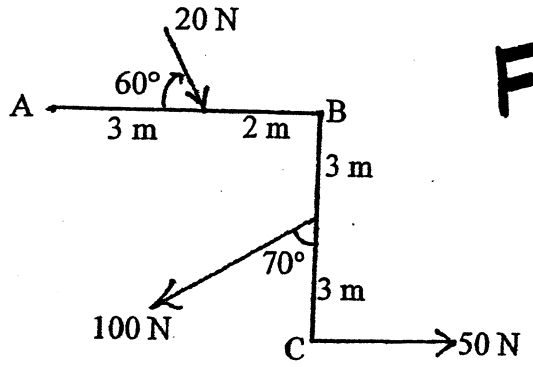
21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Ashad

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

Subject: - Applied Mechanics *(CE401)*

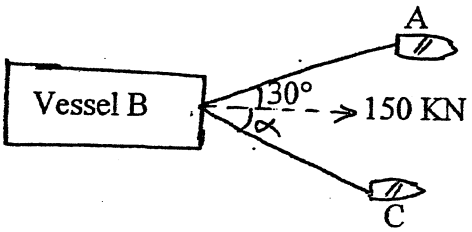
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. Describe the scope of applied mechanics in engineering. [3]
2. What is the physical meaning of equilibrium and why it is important in structure? How can we draw good Free Body Diagram? Explain with suitable examples. [4+4]
3. Determine magnitude, direction and line of action of the resultant of forces acting in the system shown in figure below. [8]

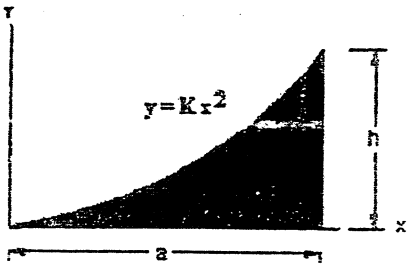


FSU PULCHOWK

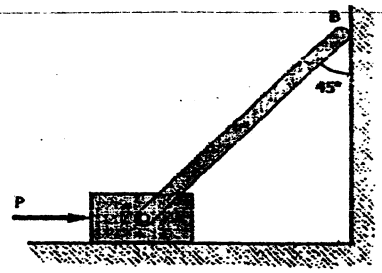
4. A commercial vessel is being pulled into larbour for unloading by two tugboats as shown in figure knowing the vessel requires 150 KN along its axis to move it steadily. Compute the tensions in rope AB and BC when $\alpha = 40°$. [4]



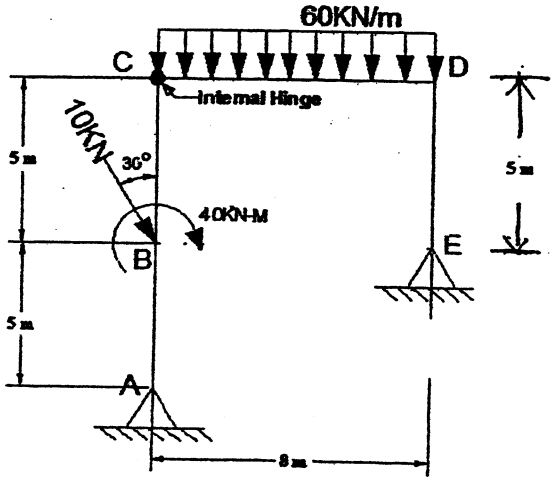
5. State and prove parallel axis theorem. Also determine the centroidal X and Y coordinate of the hatched area. [3+8]



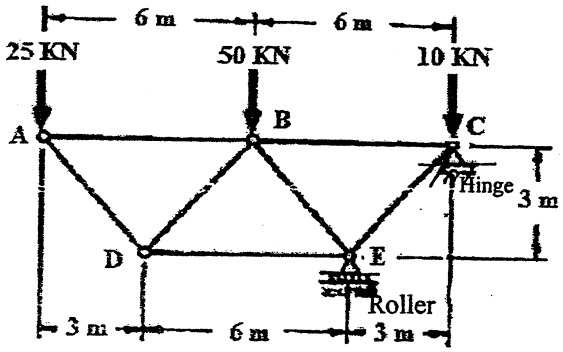
6. A uniform bar AB, weighing 424 N, is fastened by a frictionless pin to a block weighing 200 N as shown in figure. At the vertical wall, $\mu = 0.268$ while under the block, $\mu = 0.20$. Determine the force P needed to start motion to the right. [5]



7. Draw the Axial Force, Shear force and Bending Moment diagram of the given frame. Also show the salient features if any. [13]

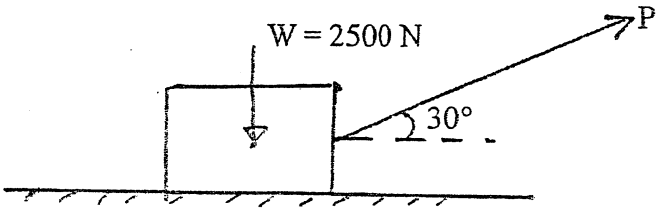


8. Determine the member forces for given truss loaded as shown in figure below. [8]



9. The motion of a vibrating particle is defined by the equations $x = 100 \sin \pi t$ and $y = 25 \cos 2\pi t$ where x and y are expressed in mm and t in sec. [10]
   a) Determine the velocity and acceleration when t = 1 sec
   b) Find the nature of path of the particle

10. Determine the magnitude of force P required to give the block an acceleration of 10 m/s^2. Coefficient of friction between the block and the floor is 0.25. [10]



21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING

Examination Control Division

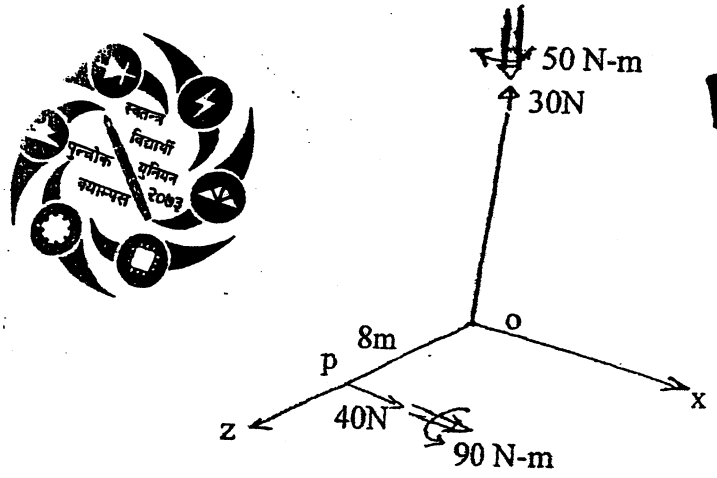
2069 Chaitra

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

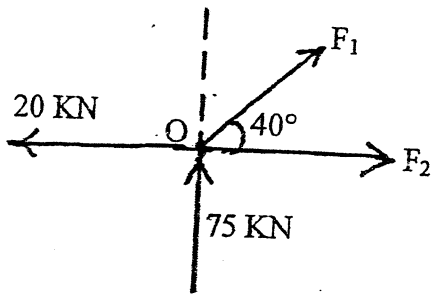
Subject: - Applied Mechanics *(CE401)*

- ✓ 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.*

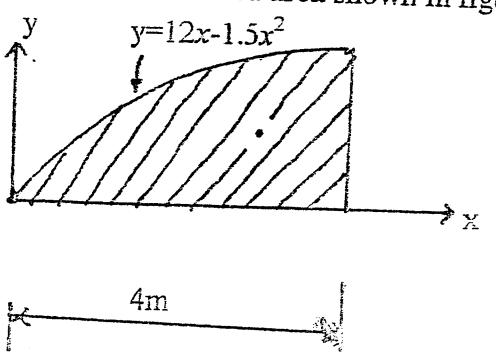
1. Describe briefly the concept of particle, rigid body and deformable body. [3]
2. Describe Free Body Diagram and physical meaning of equilibrium. Also describe the importance of Free Body Diagram and equilibrium in structural analysis. [2+2+2+2]
3. Replace the two wrenches as shown in figure by a single equivalent wrench and determine (a) the resultant force, (b) indicate it's line of action. [8]



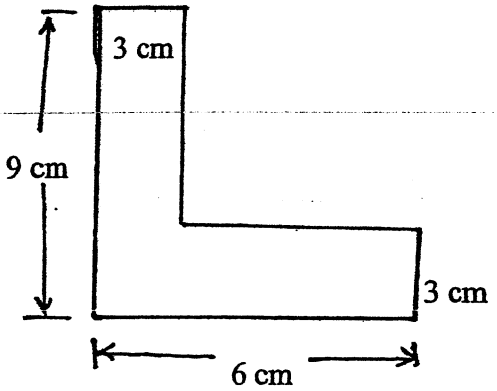
4. Determine the value of F1 and F2 if the forces shown in figure below are in equilibrium. [4]



5. Determine centroidal x coordinate of the shaded area shown in figure below. [4]

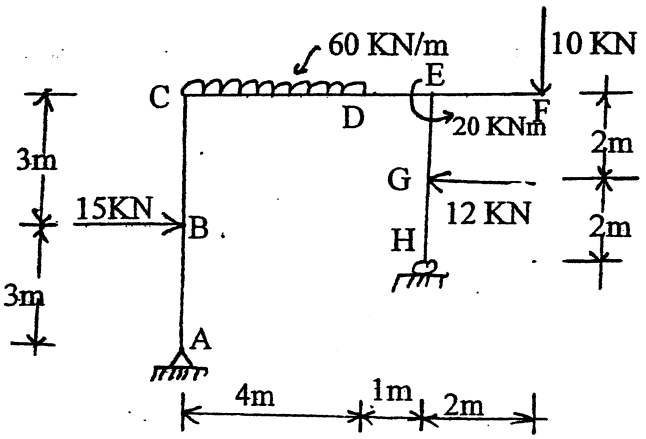


6. Determine radius of gyration (r_x) of the angle section shown in figure below about centrodal x-axis. [8]

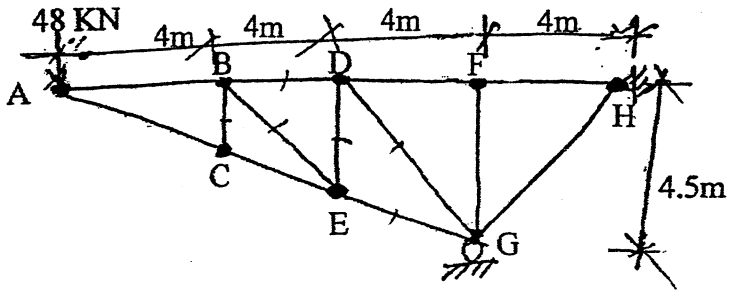


7. Illustrate impending motion state of friction and demonstrate the change in frictional force for different motion stages using relevant figure. [4]

8. Draw AFD, SFD and BMD of the given frame loaded as shown in figure below. Indicate the salient feature if any. [14]

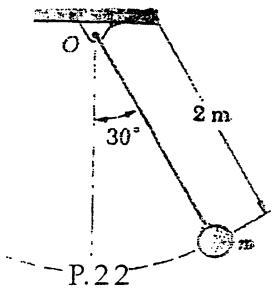


9. Compute the force developed in the member BC, BD, BE, DE, DG and EG of the given truss loaded as shown in figure. [7]



10. Define uniformly rectilinear motion and uniformly accelerated rectilinear motion. A projectile is fired with an initial velocity of 244m/s at a target B located 610m above the level of gun A and at a horizontal distance of 3658m. Neglecting air resistance, determine the value of the firing angle. [2+8]

11. Define the linear momentum and angular momentum. Find the velocity and acceleration of the bob in the given position. The bob of a 2m pendulum describes an arc of a circle in a vertical plane. Tension in the cord is 2.5 times the weight of the bob for the position shown. [2+8]



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21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

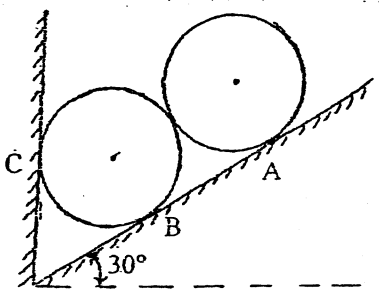
2068 Chaitra

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

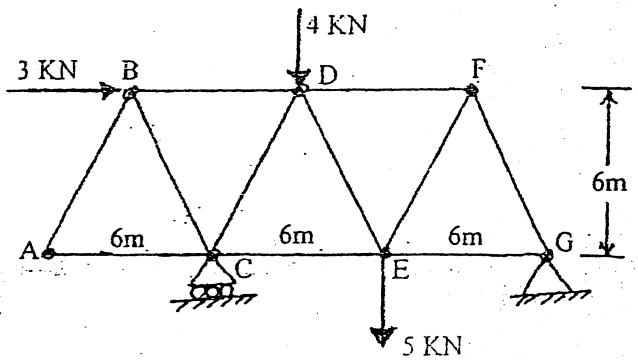
Subject: - Applied Mechanics *(CE401)*

- ✓ 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.*

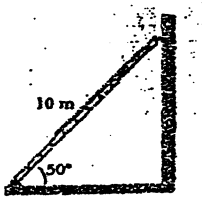
1. What are the fundamental principles of mechanics? Explain briefly. [3]
2. Two identical rollers each of weight W = 500N are supported by an inclined plane and a vertical wall as shown figure below. Draw the free body diagram of each roller separately. Assuming smooth surfaces, find the reactions induced at the points of support A, B and C. [8]



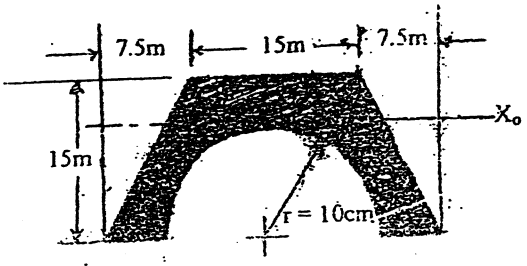
3. Use the method of sections to compute the force in bars BC, DF and CE of the Warren truss loaded as shown in figure below. [8]



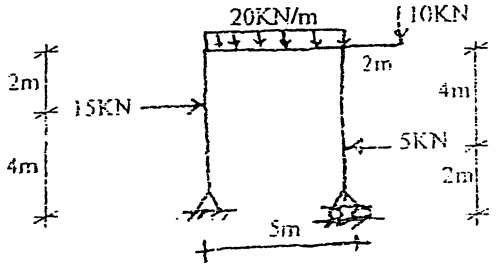
4. A 10m ladder is leaning against a smooth vertical wall and the floor with the friction coefficient 0.4. Determine the normal reactions and the friction force at the top and bottom of the ladder. [4]



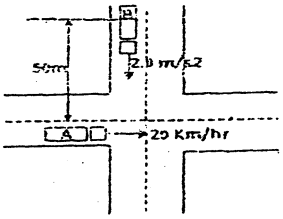
5. Determine the moment of inertia of the shaded area shown in figure below about its centroidal X_0 axis. [12]



6. What are statically determinate and indeterminate structures? Draw axial force, shear and bending moment diagrams of the frame loaded as shown in figure below. [3+10]



7. Define the uniformly rectilinear and uniformly accelerated rectilinear motion. Automobile 'A' is traveling east at the constant speed of 20 Km/hr. As automobile 'A' crosses the intersection shown, automobile 'B' starts rest 35m North of a intersection and moves South with a constant acceleration of $2m/s^2$. Determine the position, velocity and accceleration of 'B' relative to 'A'; 10 sec after 'A' crosses the intersection. [2+8]



8. A particle projected at an angle of 20° with the horizontal axis with an initial velocity of 50m/sec. hits the target located at 'h' meter below the horizontal axis having the inclined

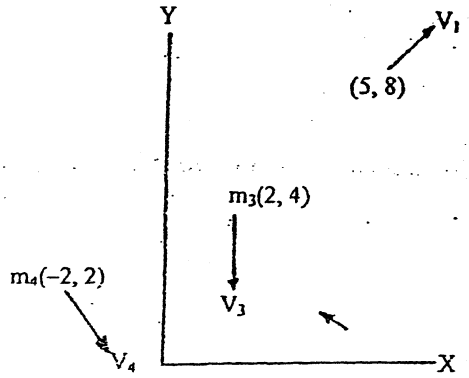
slope of ¾ download from the axis of the target. Determine the sloping distance covered by the projectile and the maximum height achieved by the projectile from the target. [12]

OR

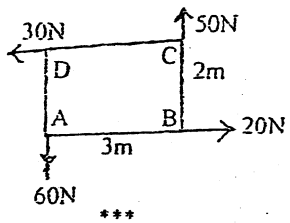
In Figure below is shown a system of particles at time t moving in the xy plane. The following data apply:

$m_1 = 0.5$ kg $\quad V_1 = 1.5i + 1.5j$ m/s
$m_2 = 0.35$ kg $\quad V_2 = -1.3i + 1j$
$m_3 = 1$ kg $\quad V_3 = -1.3i$
$m_4 = 0.75$ kg $\quad V_4 = 1i - 1.3j$

a) What is the total linear momentum of the system?
b) What is the linear momentum of the center of mass?
c) What is the total moment of momentum of the system about the origin and about point (2,6) ? [4+4+4]



9. Define moment and couple. Determine magnitude direction and position of the resultant force of the forces acting on a rectangular plate shown in figure below. [2+8]



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21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2068 Baishakh

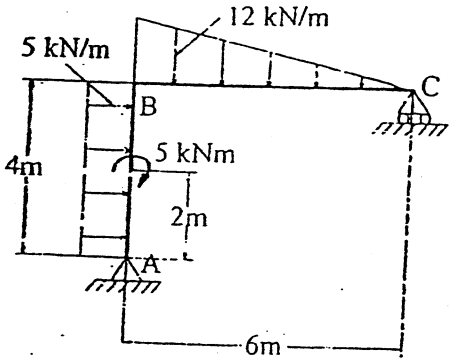
Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BIE, B.Agri., B.Arch.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Applied Mechanics

- ✓ 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.*

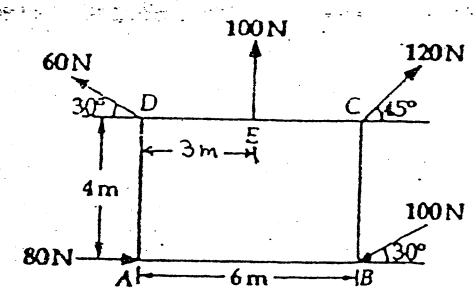
1. a) Derive the relationship between load, shear force and bending moment. [4]

   b) Draw axial force, shear force and bending moment diagram for the given loaded frame as shown in figure below. [12]



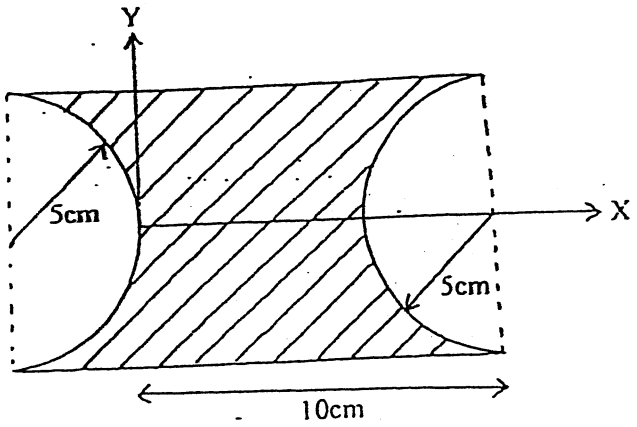
2. a) What is the equilibrium of a body? Write the conditions of equilibrium of a particle. [4]

   b) A plate of size 6m x 4m is acted upon by a set of forces in its plane as shown in figure below. Determine the magnitude, direction and position of resultant force. [12]



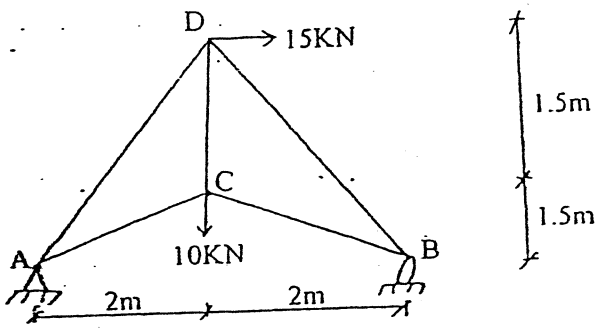
3. a) Determine the centroid of right angle triangle by method of integration. [6]

b) Find the moment of inertia and radius of gyration about X-Y axis of the figure shown below. [10]



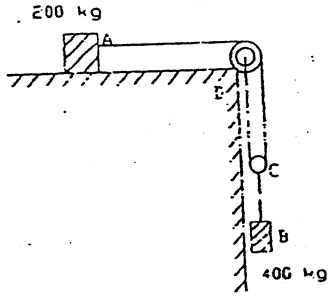
4. a) What is the angle of friction? Explain about tipping and sliding of block? [6]

b) Determine the support reactions and forces in all member in the given pin jointed truss as shown in figure below. [1



5. a) What is the linear momentum? Explain about rate of change of it. [4]

b) Two blocks shown in figure below start from rest. The horizontal plane and the pulleys are frictionless, and the pulley is assumed to be of negligible mass. Determine the acceleration of each block and the tension in each rod. [12]



6. a) Mention the types of support on structures and support reactions with its free body diagram. [6]

b) For a particular body moving rectilinearly, $a = -10x^{-2}$, where a is the acceleration in m/sec^2 and x is in meter units. It is known that when t = 2 sec, x = 8m and v = 3m/sec. Determine its acceleration when t = 3 sec. [10]

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21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2068 Shrawan

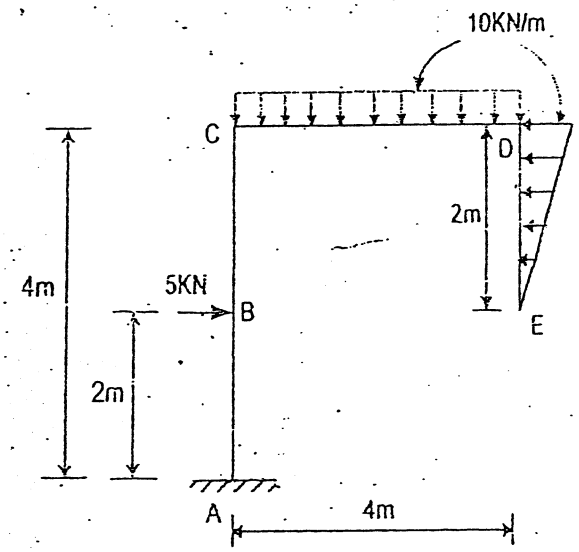
Exam.	New Back (2066 Batch & Later)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BIE, B.Agri., B.Arch.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Applied Mechanics

- ✓ 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.*

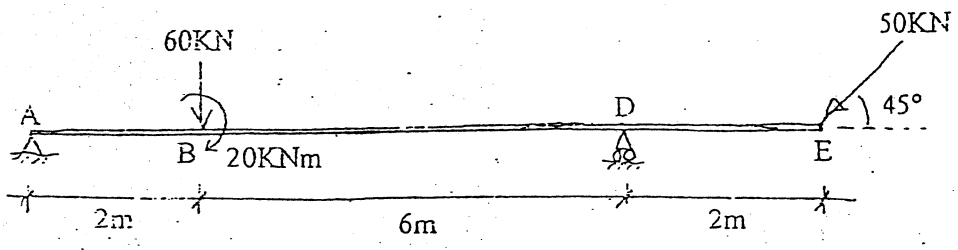
1. a) What are the fundamental concepts and principles of Newtonian mechanics? [4]

   b) Draw bending moment diagram, shear force diagram and axial force diagram for the given figure below. And also indicate the salient points if any. [12]



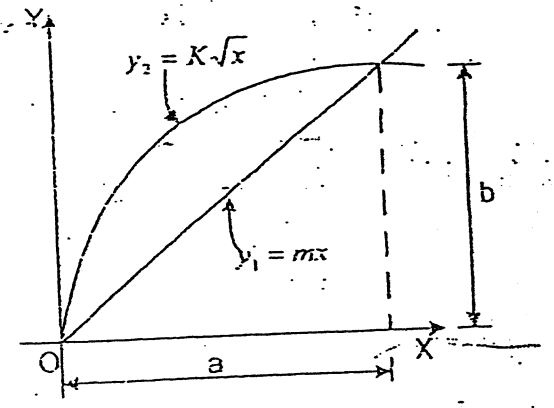
2. a) Explain principles of transmissibility and its limitations. [6]

   b) Determine force couple system about point 'A' for the given system of forces as shown in figure below. [10]

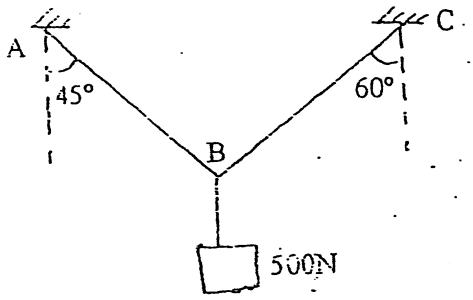


3. a) Explain the characteristics of friction with sketch. [4]

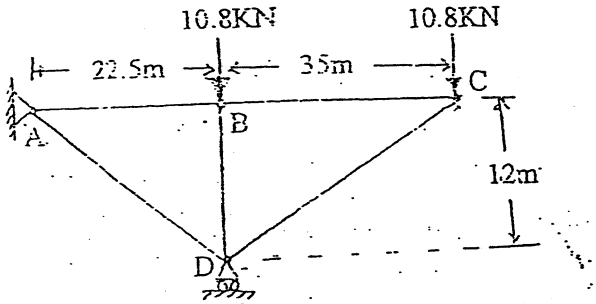
b) Determine the moment of inertia of the common area as shown in figure below about x and y axis. [12]



4. a) Determine the forces in cables AB and AC as shown in figure below. [5]



b) Determine the forces in all members of the truss shown in figure below. [11]



5. a) The position of particle which moves along a straight line is defined by the relation $x = t^3/3 - 6t^2 - 15t$. Where x is in meter and t is in seconds. Determine: [8]

i) The time at which velocity will be zero
ii) The position and distance travelled by the particle at that time
iii) The acceleration of the particle at that time

b) Define dynamic equilibrium. Also state equation of motion for rectilinear and curvilinear motion of particle. [8]

6. a) How the motion of a particle is found when the acceleration is a given function of time? [6]

b) A particle projected at an angle of θ to horizontal axis with an initial velocity of 61m/sec hits a target located at 600 meter below the horizontal axis and having the inclined slope of ¾ downward from the axis of to the target. Find the projected angle θ and the maximum height achieved by particle from the target. [10]

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21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2067 Ashadh

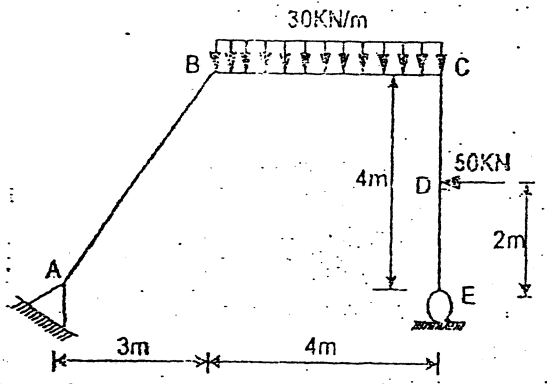
Exam.	Regular/Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BIE, B.Agri., B.Arch.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Applied Mechanics

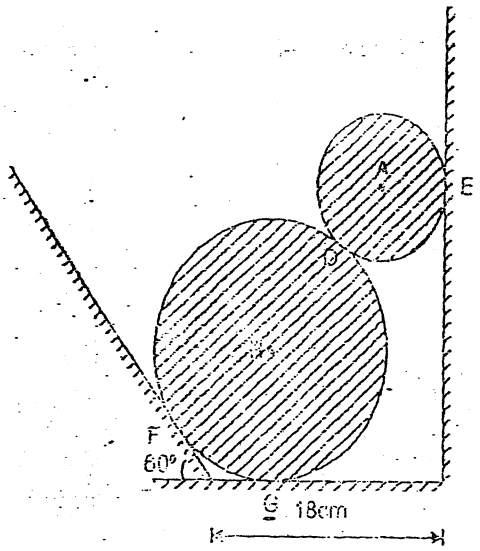
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any Five questions.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Assume suitable data if necessary.*

1. a) Define rigid and deformable body. Explain principles of free body diagram and static equilibrium while solving problems in statics? Support your answer with examples. [4]

   b) Draw bending moment, shear force and axial force diagrams for the given figure. And also give ordinates of the salient points, if any. [12]

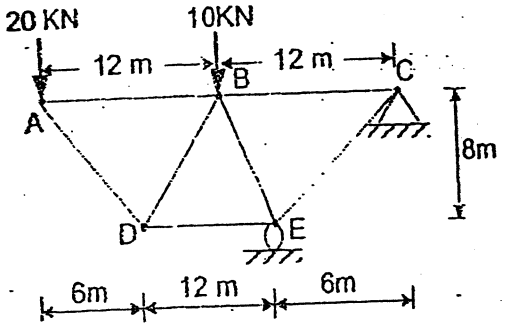


2. a) Two cylinders A and B rest in a channel as shown in figure below. 'A' has a diameter of 10cm and weight 20kg. 'B' has 18cm diameter and weight 50kg. The channel is 18cm wide at the bottom with one side vertical and other side at 120° as shown. Determine the reactions at four contact points. [11]



b) State and prove the parallel axis theorem for moment of inertia. [5]

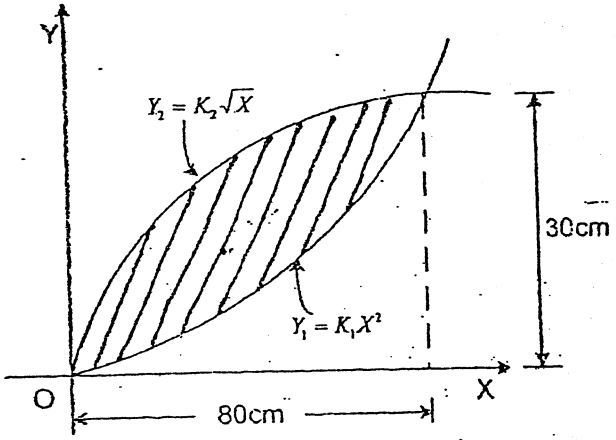
3. a) Calculate the member forces of the given truss shown in figure below. [10]



b) Define discrete and continuum structure. Also discuss about stability, indeterminacy, and determinacy of structures with suitable examples. [6]

4. a) Define limiting friction and impending motion. Justify why coefficient of static friction is greater than coefficient of kinetic friction. [5]

b) Determine the moment of inertia and radius of gyration of the common area as shown in figure below about x and y axis. [11]



5. a) The acceleration of a particle is directly proportional to the time (t). At time (t) = 0, the velocity of the particle is v = 16 m/sec. Knowing that velocity (v) = 15 m/sec position (x) = 20m and time (t) = 1 sec, determine the velocity, the position and total distance travelled when time (t) = 7 sec. [8]

b) A particle is projected at an angle of 30° to horizontal axis with an initial velocity of 61m/sec hit the target located at 'h' meter below the horizontal axis and having the inclined slope of ¾ downward from the axis of the target. Find the sloping distance covered by the projectile and the maximum height achieved by particle from the target. [8]

6. a) Define angular momentum and also prove that rate of change of angular momentum is equal to the moment of the force acting on that particle about the same point. [6]

b) The motion of a particle is defined by the position vector (r) = $3t^2\mathbf{i} + 4t^3\mathbf{j} + 5t^4\mathbf{k}$ where r is in meter and t is in second. Find the normal and tangential component of acceleration and the principal radius of curvature at the instant when t = 4 secs. [10]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

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

Subject: - Engineering Mathematics I *(SH 404)*

- ✓ 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. If $y=(x^2-1)^n$, then show that $(x^2-1)^n y_{n+2}+2xy_{n+1}-n(n+1)y_n=0$

   OR

   Find the pedal equation of the curve $r^2=a^2\cos 2\theta$
2. State Rolle's theorem and write its geometrical interpretation. Verify Rolle's theorem for $f(x)=\frac{\sin x}{e^x}$, $x\in[0,\pi]$.
3. Evaluate the limit: $\lim_{x\to 0}\left(\frac{\tan x}{x}\right)^{\frac{1}{x}}$.
4. Find the asymptotes of the curve: $y^3-x^2y+2y^2+4y+x=0$.
5. Find the radius of curvature of the curve $\sqrt{x}+\sqrt{y}=\sqrt{a}$ at the point where it cuts the line $y=x$.
6. Using properties of definite integral evaluate $\int_0^{\frac{\pi}{2}}\frac{\sqrt{\cos x}}{\sqrt{\sin x}+\sqrt{\cos x}}dx$.
7. If possible, evaluate the improper integral: $\int_0^a\sqrt{\frac{a-x}{x}}dx$.
8. Define Beta and Gamma function. Also use it to evaluate: $\int_0^{2a}x^5\sqrt{2ax-x^2}\,dx$.
9. Obtain the reduction formula for $\int\sin^n x\,dx$ and hence use it to evaluate $\int\sin^6 x\,dx$.
10. Find the area bounded by the curve $x^2y=a^2(a-y)$ and the x-axis.

    OR

    Find the volume of the solid formed by the revolution of the cycloid $x=a(\theta+\sin\theta)$, $y=a(1-\cos\theta)$ about the tangent at vertex.
11. Solve the differential equation $\sin x\frac{dy}{dx}+\cos x=2\sin x\cos x$.
12. Find the general solution of the differential equation $p^2-py+x=0$ where $p=\frac{dy}{dx}$.
13. Find the general solution of the differential equation: $(D^2-4D+4)y=x^3e^{2x}$
14. Deduce the standard equation of an ellipse.
15. Identify the conic section $8x^2+6y^2-16x+12y+13=0$ and determine its eccentricity, latus-rectum and foci.
16. Describe and sketch the graph of the polar curve: $r=\frac{10}{3+2\cos\theta}$

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

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

Subject: - Engineering Mathematics I *(SH 404)*

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

1. State Leibnitz theorem and use it to prove the following.

   If $y = a\cos(\log x) + b\sin(\log x)$ then $x^2 y_{n+2} + (2n+1)xy_n + (n^2+1)y_n = 0.$

2. State Lagrange's Mean value theorem. Verify it for the function $f(x) = x^3-3x^2+2$, $x \in [2,4]$.

3. Evaluate the indeterminate limit : $\lim_{x \to 0}\left(\frac{\sin x}{x}\right)^{\frac{1}{x^2}}$

4. Find the asymptotes of the curve $x^2(x-y)^2 - a^2(x^2+y^2) = 0.$

5. Find the radius of curvature to the curve $r^3 = a^3 \cos 3\theta$ at any point (r,θ).

6. Show that: $\int_0^a \frac{\sqrt{x}}{\sqrt{x}-\sqrt{a-x}}dx = \frac{a}{2}$

7. Evaluate the improper integral: $\int_{-1}^{2} \frac{1}{x^3}dx.$

8. Define Gamma function. Use Gamma function, to show $\int_0^{\pi/2} \cos^2 6\theta \sin^4 3\theta d\theta = \frac{7\pi}{192}.$

9. Obtain a reduction formula for $\int \sin^n x dx$ and hence find $\int \sin^6 x dx.$

10. Find the area of the loop of the curve : $x = a(1-t^2), y = at(1-t^2), \ -1 \le t \le 1$

OR

Find the volume of the solid generated by revolving the asteriod $x^{2/3} + y^{2/3} = a^{2/3}$ about the axis of x.

11. Solve the differential equation: $(x^2 - y^2)dx + 2xydy = 0$

12. Find the general solution of the differential equation: cos px cos y + sin px sin y = p.

13. Solve the differential equation : $(D^2 - D - 2)y = \sin 2x + e^x$

14. Transform the equation $12x^2-10xy+2y^2+11x-5y+2=0$ by the translating the axes into an equation with linear terms missing.

15. If e_1 and e_2 is the eccentricity of the hyperbola and its conjugate prove that $\frac{1}{e_1^2} + \frac{1}{e_2^2} = 1.$

16. Find the center, length of axes and eccentricity of the ellipse $2x^2 + 3y^2 - 4x - 12y + 13 = 0.$

OR

Describe and sketch the graph of the polar equation of the conic $r = \frac{10}{3 + 2\cos\theta}.$

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All except BAR	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering mathematics I *(SH 401)*

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

1. If $y=a\cos(\log x) + b \sin(\log x)$ prove that:
   (i) $x^2y_2+xy_1+y=0$
   (ii) $x^2y_{n+2}+(2n+1)xy_{n+1}+(n^2+1)y_n=0$
2. State and prove Lagrange's mean value theorem.
3. State L' Hospital's Rule and hence evaluate $\lim_{x \to 0}(\cot x)^{\sin 2x}$
4. Find the asymptote of $(x+y)^2(x+2y+2) = x+9y-2$
5. Find the radius of curvature of the curve $r = a(1 - \cos\theta)$.
   Or,
   Find the pedal equation of $y^2=4a(x+a)$
6. Evaluate $\int_0^{\pi/2} \frac{x \sin x \cos x}{\cos^4 x + \sin^4 x} dx$
7. Using the rule of differentiation under the integral sign, evaluate $\int_0^{\infty} \frac{\log(1+a^2x^2)}{1+b^2x^2} dx$
8. Obtain the reduction formula for $\int_0^{\pi/2} \cos^n x dx$ and hence evaluate $\int_0^{\pi/2} \cos^{10} x dx$.
9. Obtain the area of a loop of the curve $y^2(a^2+x^2)=x^2(a^2-x^2)$
   Or,
   Find the volume of the solid formed by the revolution of the cycloid $x=a(\theta+\sin\theta)$
10. Solve the differential equation: $\frac{dy}{dx} = \frac{y}{x} + \tan\frac{y}{x}$
11. Find the general solution of $y=Px+x^4p^2$
12. Solve $(D^2-2D+5)y = e^{2x}\sin x$
13. Solve $x^2\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} - 4y = x^4$
    Or,
    A radio active material has an initial mass 100mg. After two years, it is left to 75mg. Find the amount of the material at any time t.
14. What does the equation $3x^2+3y^2+2xy=2$ become when the axes are turned through an angle 45° with the original axes.
15. Obtain the equation of hyperbola in standard form.
16. Find the center for the conic $3x^2+8xy-3y^2-40x-20y+50=0$.

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

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

Subject: - Engineering Mathematics I *(SH 404)*

- ✓ 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. State Leibnitz's theorem. If $y=\log(x+\sqrt{a^2+x^2})$, then show that $(a^2+x^2)y_{n+2}+(2n+1)xy_{n+1}+n^2y_n=0$.
2. State Lagrange's Mean value theorem. Interpret it geometrically. Verify it for the function $f(x)=2x^2+3x+1, \quad x\in[-2,5]$
3. Evaluate: $\lim_{x\to 0}\left(\frac{\tan x}{x}\right)^{1/x^2}$
4. Find the asymptotes of the curve $x^3+y^3-xy^2-x^2y+x^2-y^2=1$
5. Prove that the pedal equation of the curve $r=\frac{2a}{1-\cos\theta}$ is $p^2=ar$.

OR

Find the radius of curvature for the curve : $x=a(\varphi+\sin\varphi), y=a(1-\cos\varphi)$ at the point $\varphi=0°$.

6. Show that $\int_0^{\pi/2}\frac{1}{1+\sqrt{\tan x}}dx=\frac{\pi}{4}$
7. Evaluate the improper integral $\int_0^{\infty}x^2e^{-x}dx$
8. Solve: $\frac{d^2y}{dx^2}-2\frac{dy}{dx}+4y=e^x\cos x$
9. Using Gamma function evaluate: $\int_0^{\pi}\sin^6\frac{x}{2}\cos^8\frac{x}{2}dx$
10. Define Hyperbola. Find its equation in the standard form.
11. Solve the differential equation: $(x^2+y^2)dy=xydx$
12. Solve: $y=px+ap-ap^2$
13. Find the condition that the line $x\cos\alpha+y\sin\alpha=p$ touches the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ and hence find the point of contact.
14. Deduce the standard equation of the ellipse.
15. Show that the line $lx+my+n=0$ is a tangent of the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ if $a^2l^2-m^2b^2=n^2$
16. Identify the curve: $9x^2+4xy+6y^2-22x-16y+9=0$ if it is central conic, find its center.

OR

Describe and sketch the graph of the curve: $r=\frac{10}{2+3\cos\theta}$.

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84 \ TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

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

Subject: - Engineering Mathematics I *(SH404)*

- ✓ 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. If $y = \sin^{-1} x$, show that
$(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - n^2 y_n = 0.$ [5]

2. Obtain the series expansion of $e^{\sin x}$ by Maclaurin's theorem as far as the term x^4. [5]

3. State L'-Hospital's rule. Evaluate [1+4]
$$\lim_{x \to 0} \sin x . \log x^2$$

4. Find the asymptotes of the curve,
$(x+y)^2(x+2y+2) = x+9y-2$ [5]

5. Find the pedal equation of the curve $r^m = a^m \cos m\theta$. [5]

6. Show that $\int_0^a \frac{1}{x+\sqrt{a^2-x^2}} dx = \frac{\pi}{4}$ [5]

7. Evaluate the integral: $\int_0^\infty \frac{x}{x^2+4} dx$ [5]

8. Obtain the reduction formula for $\int \cos^n x \, dx$ and hence find $\int \cos^6 x \, dx$. [5]

9. Using Gamma function evaluate
$\int_0^{2a} x^5 \sqrt{2ax - x^2} dx$. [5]

10. Show that the area of the loop of the curve $ay^2 = x^2(a-x)$ is $\frac{8}{15}a^2$. [5]

11. Transform the equation $3x^2 - 2xy + 4y^2 + 8x - 10y + 8 = 0$ by translating the axes into an equation with linear term missing. [5]

12. Obtain equation of hyperbola in standard form. [5]

13. Find the foci, directrix, latus rectum and eccentricity of the ellipse $7x^2 + 6y^2 - 42x - 24y + 86 = 0$. [5]

14. Solve any three of the following: [3×5]

a) $\frac{dy}{dx} = \frac{2x+3y+4}{4x+6y+5}$

b) $\frac{dy}{dx} + x \sin 2y = x^3 \cos^2 y$

c) $y = 2px + p^3 y^2$ where $p = \frac{dy}{dx}$

d) $(D^2 - 2D + 1)y = e^x x^2$

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84 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Chaitra

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

Subject: - Engineering Mathematics I *(SH404)*

- ✓ 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. If $y=\log\left(x+\sqrt{x^2+a^2}\right)$, prove that $\left(x^2+a^2\right)y_{n+2}+(2n+1)xy_{n+1}+n^2y_n=0$. [5]
2. Assuming the validity of expansion, find the expansion of function $\log_e(1+\sin x)$, by using Maclaurin's theorem. [5]
3. Evaluate: $\lim_{x\to 0}\left(\frac{1}{x^2}-\frac{1}{\sin^2 x}\right)$. [5]
4. Find the asymptotes of the curve, $\left(x^2-y^2\right)^2-2\left(x^2+y^2\right)+x-1=0$. [5]
5. Find the radius of curvature of the curve $\sqrt{x}+\sqrt{y}=\sqrt{a}$ at the point where it cuts the line $y=x$.

   OR

   Find the pedal equation of the curve $r^2=a^2\cos 2\theta$ [5]
6. Prove that $\int_0^{\pi/2}\frac{1}{1+\sqrt{\tan x}}dx=\frac{\pi}{4}$. [5]
7. Evaluate the improper integral $\int_{-\infty}^{\infty}\frac{e^x}{1+e^{2x}}dx$. [5]
8. Obtain the reduction formula for $\int\sec^n x\,dx$ and hence evaluate $\int\sec^6 x\,dx$. [5]
9. Define Gamma function. Use Beta and Gamma function to evaluate $\int_0^1\frac{1}{\left(1-x^6\right)^{1/6}}dx$. [5]
10. Find the area of astroid $x^{2/3}+y^{2/3}=a^{2/3}$. [5]
11. What does the equation $3x^2+2xy+3y^2=2$ become when the axes are turned through an angle 45° to the original axes? [5]
12. Obtain the equation of the ellipse in standard form. [5]
13. Describe and sketch the graph of the polar equation of the conic $r=\frac{10\operatorname{cosec}\theta}{2\operatorname{cosec}\theta+3}$.

    OR

    Find the centre, length of axes and the eccentricity of the conic section $2x^2+3y^2-4x-12y+13=0$. [5]

[3×5]

14. Solve any three of the following:
    a) $x\,dy-y\,dx=\sqrt{x^2+y^2}\,dx$
    b) $\frac{dy}{dx}=y\tan x-y^2\sec x$
    c) $\sin y\cos px-\cos y\sin px=p$, where $p=\frac{dy}{dx}$
    d) $\frac{d^2y}{dx^2}-y=x^2\cos x$

74 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

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

Subject: - Engineering Mathematics I *(SH404)*

- ✓ 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. If $y = \sin^{-1} x$, prove that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - n^2 y_n = 0$. [5]

2. Obtain the series expansion of $\cosh x$ by Maclaurin's theorem as far as the term x^6. [5]

3. Evaluate $\lim_{x\to 0} \dfrac{x\cos x - \log(1+x)}{x^2}$. [5]

4. Find the asymptotes of the curve $x^3 - 2x^2y + xy^2 + x^2 - xy + 2 = 0$ [5]

5. Show that the radius of curvature at any point (r,θ) of the curve [5]

$$r^m = a^m \cos m\theta \text{ is } \frac{a^m}{(m+1).r^{m-1}}.$$

6. Using the property of definite integral prove that $\int_0^{\frac{\pi}{2}} \dfrac{\sqrt{\cot x}}{1+\sqrt{\cot x}}\,dx = \dfrac{\pi}{4}$ [5]

7. Evaluate the improper integrals $\int_0^\infty x^2 e^{-x^3}\,dx$. [5]

8. Obtain a reduction formula for $\int \sec^n x\,dx$ and hence evaluate $\int \sec^6 x\,dx$. [5]

9. Using Beta Gamma function, show that $\int_0^{\pi/6} \cos^4 3\theta \sin^2 6\theta\, d\theta = \dfrac{5\pi}{192}$ [5]

10. Prove that the area of the loop of the curve $ay^2 = x^2(a-x)$ is $\dfrac{8}{15}a^2$. [5]

OR

Find the volume of the solid formed by the revolution of the ellipse $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$ about the x-axis.

11. Solve the differential equation (Any Three): [15]

(a) $\dfrac{dy}{dx} = \dfrac{x^2 y}{x^3 + y^3}$

(b) $(1+x^2)\dfrac{dy}{dx} + 2xy = 4x^2$

(c) $\sin y \cos px - \cos y \sin px = p$

(d) $\dfrac{d^2y}{dx^2} - 4y = \sin 2x$

12. What does the equation $2x + 3y = \sqrt{2}$ becomes when the axes are turned through an angle 45° to the original axes. [5]

13. Show that $3x + 4y + \sqrt{7} = 0$ is a tangent to the ellipse $3x^2 + 4y^2 = 1$ and find the point of contact. [5]

14. Describe and sketch the graph of the curve $r = \dfrac{10}{2 - 3\sin\theta}$ [5]

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84 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

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

Subject: - Engineering Mathematics I *(SH404)*

- ✓ 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. If $y = \sin^{-1} x$, prove that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - n^2 y_n = 0$
2. State Lagrange's Mean value theorem and verify the theorem for
   $f(x) = \log x, x \in [1, e]$
3. Evaluate the limit: $\lim_{x \to} b(b-x)\tan\left(\frac{\pi x}{2b}\right)$
4. Find the asympototes of the curve: $x^3 - 2x^2y + xy^2 + x^2 - xy + 2 = 0$
5. Find the radius of the curvature for the curve $x = a(t + \sin t)$, $y = a(1 - \cos t)$ at the point $t = 0$.

   OR

   Find the pedal equation of the curve $r^m = a^m \cos m\theta$

FSU-2073

6. Use properties of definite integral to show $\int_0^{\pi/2} \frac{\sin x - \cos x}{1 + \sin x \cos x} dx = 0$
7. Evaluate the improper integral: $\int_1^{\infty} \frac{dx}{x^2 + 1}$
8. Obtain the reduction formula for $\int_0^{\Pi/4} \tan^n x\, dx$ and hence evaluate $\int_0^{\Pi/4} \tan^5 x\, dx$
9. Use Beta and Gamma function to prove $\int_0^{\pi/6} \cos^4(3\theta).\sin^2(6\theta) d\theta = \frac{5\pi}{192}$
10. Find area of the astroid $x^{2/3} + y^{2/3} = a^{2/3}$ using definite intergral.
11. Solve the differential equation: $(2x+2y+3)\, dy = (x+y+1)\, dx$
12. Solve the differential equation: $x\frac{dy}{dx} + y\log y = xye^x$
13. Solve the second order linear differential equation: $\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = \sin 2x$

    OR

    Solve $xp^2 - 2yp + ax = 0$ where $p = \frac{dy}{dx}$
14. What does the equation $3(x^2 + y^2) + 2(xy - 1) = 0$ become when the axes are turned through an angle 45° to the original axes.
15. Find the condition that the line $lx + my + n = 0$ will be a tangent to the curve $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and find the point of contact.
16. Find the center, foci, eccentricity and length of latus rectum of the hyperbola $9x^2 - 16y^2 + 72x - 32y - 16 = 0$

    OR

    Sketch and describe the graph of the conic $r = \frac{10}{3 + 2\cos\theta}$

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INS: TE OF ENGINEERING, IBHUVAN UNIVERSITY

Exami ion Control Divis

2071 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	B.Arch.	Pass Marks	32
Part	I / I	Time	3 hrs.

Subject: - Engineering Mathematics I *(SH404)*

- ✓ Can es are required to give their answers in their own words as far as practicable.
- ✓ *Atter* *All questions.*
- ✓ *The* *es in the margin indicate* ***Full Marks.***
- ✓ *Assu* *uitable data if necessary.*

FSU-207

1. $y_n = (sin^{-1}x)^2$, then show that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - x^2y_n = 0$. [5]
2. State Rolle's Theorem, and hence use it to verify for the function, $f(x) = log\left\{\frac{x^2+ab}{(a+b)x}\right\}, x\epsilon[a,b]$. [5]
3. Evaluate the limit: [5]

$$\lim_{x\to 0}\left(\frac{sinx}{x}\right)^{\frac{1}{x^2}}$$

4. Find the assymptotes of the curve $x^2(x-y)^2 - a^2(x^2+y^2) = 0$. [5]
5. Find the pedal equation of the curve $r^m = a^m cosm\theta$. [5]
6. Prove that $\int_0^{\frac{\pi}{2}} \frac{x}{sinx+cosx}dx = \frac{\pi}{2\sqrt{2}}log(\sqrt{2}+1)$. [5]
7. Evaluate the improper integral $\int_1^{\infty} \frac{logx}{x^2}dx$. [5]
8. Obtain the reduction formula for $\int cos^n x dx$, and hence find $\int cos^6 x dx$. [5]
9. Use Gamma function to show $\int_0^{\infty} x^2 e^{-x^4}dx \times \int_0^{\infty} e^{-x^4}dx = \frac{\pi}{8\sqrt{2}}$. [5]
10. Find the area bounded by the cardioid r = a (1-cosθ) [5]

OR

Find the volume of the ellipsoid formed by the revolution of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ about the X-axis.

11. Solve any three of the following differential equations: [5 × 3 = 15]

a) $xdy - ydx = \sqrt{x^2+y^2}\,dx$.

b) $\frac{dy}{dx} + \frac{y}{x}logy = \frac{y}{x^2}(logy)^2$.

c) $y = 2px + p^3y^2$, where $p = \frac{dy}{dx}$.

d) $(D^2+3D+2)y = e^{2x}sinx$.

12. What does the equation $3x^2 + 3y^2 + 2xy = 2$ become when the axes are turned through an angle 45^0 to the original axes? [5]
13. Deduce the equaion of hyperbola in standard form. [5]
14. Describe and sketch the graph of the polar equation of the conic $r = \frac{4sec\theta}{2sec\theta-1}$. [5]

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INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

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

Subject: - Engineering Mathematics I *(SH404)*

- ✓ 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. If $y = (x^2 - 1)^n$, prove that $(x^2 - 1)y_{n+2} + 2xy_{n+1} - n(n+1)y_n = 0$.
2. State and prove Rolle's theorem.
3. Evaluate $\lim_{x \to 0} \left(\frac{\sin x}{x}\right)^{\frac{1}{x}}$
4. Find the asymptotes of the curve $x^3 - 2x^2y + xy^2 + x^2 - xy + 2 = 0$.
5. Show that the radius of curvature at a point (r,θ) for the curve $r = a e^{\theta \cot \alpha}$ is $\rho = r \operatorname{cosec}\alpha$
6. Show that $\int_0^{\frac{\pi}{2}} \log \sin x dx = \int_0^{\frac{\pi}{2}} \log \cos x dx = \frac{\pi}{2} \log \frac{1}{2}$

FSU-2073

7. Evaluate $\int_{-1}^{2} \frac{dx}{x^2}$
8. Use Gamma function to prove that $\int_0^{\infty} e^{-x^4} x^2 dx \times \int_0^{\infty} e^{-x^4} dx = \frac{\pi}{8\sqrt{2}}$.
9. Prove that the area of a loop of the curve $y^2(a^2 + x^2) = x^2(a^2 - x^2)$ is $\frac{a^2}{2}(\pi - 2)$.

OR

Find the volume and area of the surface generated by the revolution of the cycloid $x = a(t - \sin t)$, $y = a(t - \cos t)$ about its base i.e. the line $y = 0$.

10. Solve the differential equation $\frac{dy}{dx} = \frac{y}{x} + \tan \frac{y}{x}$.
11. Solve the differential equation $\frac{dy}{dx} = y \tan x - y^2 \sec x$.
12. Solve $y = (1 + p)x + ap^2$, where $P = \frac{dy}{dx}$.
13. Solve $(D^2 - 2D + 5)y = e^{2x} \sin x$.

14. If the axes be turned through an angle $\theta = \tan^{-1}2$, what does the equation $4xy - 3x^2 = a^2$ become?

15. Find the condition that the line $lx + my + n = 0$ may be the tangent to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$.

16. Find the centre, length of axes and eccentricity of the conic $2x^2 + 3y^2 - 4x - 12y + 13 = 0$.

OR

Identify and sketch the conic $r=\frac{12}{2-6\cos\theta}$.

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FSU-2073

74 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

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

Subject: - Engineering Mathematics I *(SH404)*

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

1. If $y = \log(x+\sqrt{x^2+a^2})$, prove that $(a^2+x^2)y_{n+2}+(2n+1)xy_{n+1}+n^2y_n = 0$.
2. Find the expansion of the function $\sin^2 x$ using Maclaurin's series up to the term containing x^6.
3. Evaluate: $\lim_{x\to 0}\frac{x\cos x - \log(1+x)}{x^2}$.
4. Find the asymptotes of the curve $x^3-2y^3+2x^2y-xy^2+xy-y^2+1=0$.
5. Show that the radius of curvature at a point (r, θ) for the curve $r = ae^{\theta\cot\alpha}$ is $r\,\mathrm{cosec}\,\alpha$.

<u>OR</u>

Find the pedal equation of the curve $r^2 = a^2\cos 2\theta$.

6. Show that $\int_0^a \frac{1}{x+\sqrt{a^2-x^2}}dx = \frac{\pi}{4}$.
7. Obtain the reduction formula for $\int \tan^n x\,dx$ and hence find $\int \tan^6 x\,dx$.
8. Evaluate using Gamma function: $\int_0^a \frac{x^4}{\sqrt{a^2-x^2}}dx$.
9. Evaluate the improper integral $\int_1^\infty \frac{\log x}{x^2}dx$.
10. Show that the area of the astroid $x^{2/3}+y^{2/3}=a^{2/3}$ is $\frac{3}{8}\pi a^2$.

<u>OR</u>

In the cycloid $x = a(\theta+\sin\theta)$, $y = a(1-\cos\theta)$, show that $s^2 = 8ay$; s being measure from the vertex.

11. Transform to the axes inclined at 30° to the original axes the equation $x^2 + 2\sqrt{3}xy - y^2 = 2a^2$.

12. Show that the line $3x + 4y + \sqrt{7} = 0$ touches the ellipse $3x^2 + 4y^2 = 1$. Find the point of contact.

13. Using the definition, establish the standard equation of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$.

OR

Describe and sketch the graph of the curve $r = \frac{12}{3 + 2\cos\theta}$.

14. Solve the differential equation $\frac{dy}{dx} + \frac{x^2 + y^2}{2xy} = 0$.

15. Find the general solution of the differential equation $y = px + p(1 - p)$

16. Find the general solution of the differential equation: $(D^2 + 2)y = \cos(\sqrt{2}x)$.

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FJU PULCHOWK

74 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Ashad

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

Subject: - Engineering Mathematics I *(SH404)*

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

1) If $y = a\cos(\log x) + b\sin(\log x)$, prove that $x^2y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0$.

<u>OR</u>

Find the pedal equation of the curve $r^m = a^m \cos m\theta$.

2) State Rolle's Theorem and verify it for the function $f(x) = \log\left\{\frac{x^2+ab}{(a+b)x}\right\}$; $a \le x \le b$.

3) Evaluate: $\lim_{x\to 0}\frac{x\cos x - \sin x}{x^3}$.

4) Find the asymptotes of the curve $x(x-y)^2 - 3(x^2-y^2) + 8y = 0$

5) Find the pedal equation to the curve $r^2 = a^2\cos 2\theta$

OR

Show that the radius of curvature at a point $(a\cos^3\theta, a\sin^3\theta)$ on the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ is $3a\sin\theta\cos\theta$.

6) Show that $\int_0^{\pi/4}\log(1+\tan x)\,dx = \frac{\pi}{8}\log 2$.

7) Obtain the reduction formula for $\int_0^{\pi/2}\sin^n x\,dx$ and hence evaluate $\int_0^{\pi/2}\sin^6 x\,dx$.

8) Evaluate by using gamma function $\int_0^1 \frac{x^6}{\sqrt{1-x^2}}dx$

9) Evaluate the following improper integral, if possible: $\int_0^a \sqrt{\frac{a-x}{x}}\,dx$.

10) Show that the area of the loop of the curve $ay^2 = x^2(a-x)$ is $\frac{8}{15}a^2$.

<u>OR</u>

Find the volume of the solid formed by the revolution of the cardioid $r = a(1+\cos\theta)$ about the initial line.

11) What does the equation $3x^2+3y^2+2xy=2$ become when the axes are turned through an angle of 45° to the original axes?

12) Find the center, length of axes, eccentricity and directrix of the ellipse $2x^2+3y^2-4x+5y+4=0$.

13) Find the condition that the line $lx + my + n = 0$ is a tangent to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$

14) Solve the differential equation $\frac{dy}{dx}=\cos(x+y)$.

15) Solve the differential equation $\frac{dy}{dx}=y\tan x - y^2\sec x$

16) Find the general solution of the differential equation: $(D^2+16)y=\cos 4x$.

OR

$x^2\frac{d^2y}{dx^2}-2x\frac{dy}{dx}+2y=\frac{1}{x}$.

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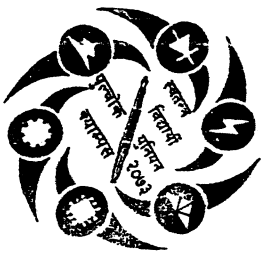
FSU PULCHOWK



74 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Chaitra

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

Subject: - Engineering Mathematics I *(SH404)*

- ✓ 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. If $y = a\cos(\log x) + b\sin(\log x)$ prove that $x^2.y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0$ [5]
2. Verify cauchy's mean value theorem for the function $f(x) = x^3$ and $g(x) = x^4$, $x \in [1,2]$ [5]
3. Evaluate: $\lim_{x \to 0}\left(\frac{\sin x}{x}\right)^{\frac{1}{x^2}}$ [5]

4. Find the asymptotes of the curve $x^3 + y^3 = 3axy$ [5]
5. In the cycloid $x=a(\theta+\sin\theta)$, $y = a(1-\cos\theta)$ at $\theta = 0$ prove that radius of curvature $\rho = 4a$ [5]
6. Evaluate: $\int_0^a \frac{dx}{x+\sqrt{a^2-x^2}}$ [5]
7. Evaluate the improper integral $\int_{-\infty}^{\infty} \frac{e^x}{1+e^{2x}}dx$ [5]
8. Obtain a reduction formula for $\int \tan^n x\,dx$ and hence find $\int \tan^6 x\,dx$ [5]
9. Use Gamma function to prove that $\int_0^1 \frac{dx}{(1-x^6)^{\frac{1}{6}}} = \frac{\pi}{3}$ [5]
10. Find the area included between the two parabolas as $y^2 = 4ax$ and $x^2 = 4ay$ [5]
11. Transform to axes inclined at 30° to the original axes the equation $x^2 + 2\sqrt{3}(xy) - y^2 = 2a^2$ [5]
12. If e_1 and e_2 be the eccentricities of the hyperbolas $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and $\frac{x^2}{a^2} - \frac{y^2}{b^2} = -1$ show that $\frac{1}{e_1^2} + \frac{1}{e_2^2} = 1$ [5]
13. Describe and sketch the graph of the equation $r = \frac{12}{3+2\cos\theta}$ [5]
14. Solve any three of the following differential equations [5×3]

a) $x\,dy - y\,dx = \sqrt{x^2+y^2}\,dx$

b) $(1+x^2)\frac{dy}{dx} + y = e^{\tan^{-1}x}$

c) $y = yp^2 + 2px$

d) $(D^2 - 3D + 2)y = e^x$

01R TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Ashad

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

Subject: - Engineering Mathematics *(SH 401)*

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

1. If $y \equiv (x^2-1)^n$, prove that $(x^2-1)y_{n+2}+2xy_{n+1}-n(n+1)y_n = 0$.
2. State and prove Lagrange's mean value theorem and verify $f(x) = \log x$, $x \in [i,e]$.
3. Evaluate $\lim_{x \to 0}\left(\frac{1}{x^2}-\frac{1}{\sin^2 x}\right)$.
4. Find the asymptotes of the curve $x(x-y)^2-3(x^2-y^2)+8y = 0$.
5. Find the tangent at (a, b) to the curve $\left(\frac{x}{a}\right)^3+\left(\frac{y}{b}\right)^3 = 2$.
6. Evaluate $\int_{\infty}^{\alpha}\frac{dx}{x^3}$.
7. Use Gamma function to prove $\int_0^{\pi}\sin^6\frac{x}{2}\cos^6\frac{x}{2}dx = \frac{5\pi}{2^{11}}$
8. Use method of differentiation under integral sign, evaluate $\int_0^{\alpha}\frac{\mathrm{Tan}^{-1}(ax)}{x(1+x^2)}dx$.
9. Find the area between the curve and its asymptotes $y^2(a-x) = x^3$.

OR

Find the volume of the ellipscoid formed by the revolution of an ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2} = 1$.

10. Transform the equation $3x^2-2xy+4y^2+8x-10y+8=0$ by translating the axis into an equation with linear term missing.
11. Find the equation of ellipse whose centre is origin and whose axis are the axis of coordinates and passes through the pair of curves (1,6) and (2,3).
12. Prove that the product of the semi axis of conic $5x^2+6xy+5y^2+12x+4y-4=0$ is 3.
13. Solve the differential equation $xdy-ydx = \sqrt{x^2+y^2}\,dx$.
14. Find the general solution of the differential equation $xy^2(p^2+2)=2py^3+x^3$
15. Find the general solution of the differential equation $(x^2D^2+4xD+2)y=e^x$.
16. A tank contains 1000 liters of fresh water. Salt water which contains 150gms of salt per liter, runs into it at the rate of 5 liter per minute and well-stirred mixture runs out of it at the same rate. When will the tank contain 5000gms of salt?

OR

Solve $\frac{d^2y}{dx^2}-y = x^2\cos x$.

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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Chaitra

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

Subject: - Engineering Mathmatics I *(SH 401)*

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

1. If $y^{1/m} + y^{-1/m} = 2x$ Show that:
   a) $(x^2-1)y_2+xy_1-m^2y = 0$
   b) $(x^2-1)y_{n+2}+(2n+1)xy_{n+1} + (n^2-m^2)\,y_n = 0.$
2. State the Rolle's theorem and use it to prove Lagrange's mean value theorem.
3. Evaluate: $\lim_{x \to 0}\left(\frac{1}{x^2} - \frac{1}{\sin^2 x}\right)$
4. Find the asymptotes of the curve $a^2b^2 + 2ab^2x + b^2x^2 + a^2x^2 + 2ax^3 + x^4 - x^2y^2 = 0.$
5. Find the pedal equation of the curve $r^m = a^m \cos m\theta$.
6. Show that $\int_0^{\frac{\pi}{2}} \frac{x}{(\sin x + \cos x)}dx = \frac{\pi}{2\sqrt{2}}\log(\sqrt{2}+1)$
7. Apply differentiation under integral sign to evaluate $\int_0^{\infty} \frac{e^{-x}\sin bx}{x}dx$
8. Use Gamma function to evaluate $\int_0^1 x^6\sqrt{1-x^2}\,dx$
9. Find the area of curve $y^2(2a - x) = x^3$ and its asymptotes.

   OR

   Find the volume of solid formed by the revolution of the cardiode $r = a(1 + \cos\theta)$ about the initial line.
10. Solve the differential equation $\frac{dy}{dx} - 2y\tan x = y^2\tan x$
11. Solve the differential equation $xp^2 - 2yp + ax = 0$ where $p = dy/dx$.
12. Solve $(D^2 - 2D + 5)y = 10\sin x$
13. Solve the differential equation $x^2\frac{d^2y}{dx^2} + 4x\frac{dy}{dx} + 2y = e^x$
14. Derive the equation of an ellipse in standard form.
15. Prove that the normal at a point t of the rectangular Hyperbola $xy = c^2$ meets the curve again at a point t_1 such that $t^3t_1 = -1$.
16. Find the equation of axes and length of axes of conic $x^2 - 4xy - 2y^2 + 10x + 4y = 0$

    OR

    Describe and sketch the polar conic $r = \frac{12}{(3 - 2\cos\theta)}$

03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2066 Shrawan

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	All (Except B.Arch.)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Mathematics I

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

1. Find the angle of intersection of the pair of curves $r^n = a^n \cos n\theta$ and $r^n = a^n \sin n\theta$. [5]

OR

If $y = a\cos(\log x) + b\sin(\log x)$. Prove that $x^2 y_{n+2} + (2n+1)x\,y_{n+1} + (x^2+1)y_n = 0$

2. State Rolle's theorem and verify it for the function $f(x) = x.(x+3).e^{-(x/2)}$, $x \in [-3, 0]$ [5]

3. Evaluate: $\lim_{x \to 0} \dfrac{(1+x)^{1/x} - e}{x}$ [1+4]

4. A cone is circumscribed to a sphere of radius r. Show that when the volume of the cone is least its altitude is 4r and its semivertical angle is $\sin^{-1}(1/3)$. [5]

5. Find the asymptotes of the curve $(x+y)^2.(x+2y+2) = x + 9y - 2$ [5]

OR

Find the radius of curvature at any point (x, y) for the curve $x^{2/3} + y^{2/3} = a^{2/3}$.

6. Integrate any three [10]

a) $\int \dfrac{x.e^x}{(1+x)^2}\,dx$ b) $\int_0^1 \dfrac{\log(1+x)}{1+x^2}\,dx$

c) $\int_{-\infty}^{\infty} \dfrac{e^x}{1+e^{2x}}\,dx$ d) $\int_0^{\pi/2} \dfrac{\sqrt{\cot x}}{1+\sqrt{\cot x}}\,dx$

7. Evaluate $\int_1^4 x^3 dx$ by the method of summation. [5]

8. Obtain reduction formula for $\int \cot^n x\,dx$ and hence integrate $\int \cot^7 x\,dx$. [5]

OR

Using Gamma function show that $\int_0^{\infty} e^{-x^4} x^2 dx \times \int_0^{\infty} e^{-x^4} dx = \dfrac{\pi}{8\sqrt{2}}$

9. Find the area bounded by the cardioid $r = a(1+\cos\theta)$ [5]

OR

Find the volume of the solid formed by revolving the cycloid $x = a(\theta + \sin\theta)$, $y = a(1+\cos\theta)$ about its base.

10. Solve any three of the following differential equations. [15]

a) $x\,dy - y\,dx = \sqrt{x^2+y^2}\,dx$ b) $x\dfrac{dy}{dx} + y.\log y = xy.e^x$

c) $y - 2px + ap^2.y = 0$ d) $(D^2 - 3D + 2)y = e^x$

11. If the axes be turned through an angle $\tan\theta = 2$. What does the equation $4xy - 3x^2 = a^2$ becomes? [5]

12. Find the equation of an ellipse in the standard form. [5]

13. If e_1 and e_2 are the eccentricities of the hyperbola, and it conjugate respectively. Then prove that $\dfrac{e_1^2}{e_1^2} + \dfrac{1}{e_2^2} = 1$. [5]

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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Baishakh

Exam.	• Regular / Back		
Level	BE	Full Marks	80
Programme	All (Except B.Arch.)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Mathematics I

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

1. If $y = a\cos(\log x) + b\sin(\log x)$. Prove that $x^2.y_{n+2} + (2n+1)x.y_{n+1} + (n^2 + 1)y_n = 0$.
2. State and prove Rolle's theorem.
3. Determine the values of a, b, c, so that $\lim_{x \to 0} \frac{(a + b\cos x)x - c.\sin x}{x^3} = 1$.
4. Find the asymptotes of the curve $(x + y)^2 (x + 2y + 2) = x + 9y - 2$.
5. If e_1 and e_2 be the radii of curvature at the ends of a focal chord of the parabola $y^2 = 4ax$, prove that $e_1^{-2/3} + e_2^{-2/3} = (2a)^{-2/3}$.
6. Prove that $\int_0^{\pi} \frac{x \tan x}{\sec x + \cos x} dx = \frac{\pi^2}{4}$.
7. Apply the method of differentiation under integral sign to prove:

$$\int_0^{\pi/2} \frac{dx}{(a^2 \sin^2 x + b^2 \cos^2 x)^2} = \frac{\pi(a^2 + b^2)}{4a^3b^3}.$$

8. Use Gamma function to prove that $\int_0^1 \frac{dx}{(1 - x^6)^{1/6}} = \frac{\pi}{3}$.
9. Find the area bounded by the curve $x^2y = a^2(a-y)$ and the x axis.

OR

Find the volume of the solid formed by revolving the cycloid $x = a(\theta + \sin\theta)$, $y = a(1 + \cos\theta)$ about its base.

10. Solve the differential equation: $(1 + y^2) + (x - e^{\tan^{-1} y}) \frac{dy}{dx} = 0$.
11. Solve: $xy^2(p^2 + 2) = 2py^3 + x^3$
12. solve : $(D^2 - 2D + 5)y = e^{2x}.\sin x$
13. Solve the differential equation: $x^2 \frac{d^2y}{dx^2} + 4x \frac{dy}{dx} + 2y = e^x$
14. What does the equation $3x^2 + 3y^2 + 2xy = 2$ becomes when the axes are turned through an angle 45° to the original axis.

OR

Describe and Sketch the graph of the conic $r = \frac{10 \operatorname{cosec}\theta}{2 \operatorname{cosec}\theta + 3}$.

15. Derive the equation of Ellipse in the standard form.
16. Find the equation of tangents to the hyperbola $3x^2 - 4y^2 = 12$ which are perpendicular to the line $x - y + 2 = 0$. Also find the point of contact.

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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2067 Ashadh

Exam.	Regular/Back		
Level	BE	Full Marks	80
Programme	All (Except B.Arch.)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Mathematics I

- ✓ 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. If $y = e^{a\tan^{-1}x}$, prove that $(1+x^2)y_{n+2} + (2nx + 2x - a)y_{n+1} + n(n+1)y_n = 0$. 5
2. State and prove Lagrange's mean value theorem.
3. Evaluate $\lim_{x \to 0} \left(\frac{\sin x}{x}\right)^{\frac{1}{x}}$
4. Find the asymptotes of the curve $(x+y)^2(x+2y+z) = x + 9y - 2$.
5. Find the radius of curvature of the curve $r = a(1 - \cos\theta)$.
6. Apply the method of differentiation under integral sign to evaluate $\int_0^\infty \frac{\tan^{-1}(ax)}{x(1+x^2)}\,dx$.
7. Prove that $\int_0^{\pi/2} \frac{\sin^2 x\,dx}{\sin x + \cos x} = \frac{1}{\sqrt{2}}\log(\sqrt{2}+1)$.
8. Use Gamma function to prove $\int_0^{\pi/6} \cos^4 3\theta.\sin^2 6\theta = \frac{5\pi}{192}$. 5
9. Find, by method of integration, the area of the loop of the curve $ay^2 = x^2(a - x)$.
10. Solve the differential equation $(1+x^2)\frac{dy}{dx} + y = e^{\tan^{-1}x}$. 5
11. Solve $y = yp^2 + 2px$, where $p = dy/dx$ 5
12. Solve $(D^2 - 3D + 2)y = x^2 + x$. 5
13. Newton's law of cooling states that the temperature of an object changes at a rate proportional to the difference of temperature between the object and its surroundings. Supposing water at 100°C cools to 80°C in 10 minutes, in a room temperature of 30°C, find when the temperature of water will become 40°C?

OR

Solve the differential equation $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = \log x$.

14. Find the condition that the line $\ell x + my + n = 0$ may be the tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. 5
15. Derive the equation of a hyperbola in standard form. 5
16. Find the centre, length of axes and eccentricity of the conic $2x^2 + 3y^2 - 4x - 12y + 13 = 0$.

OR 5

Identify and sketch the conic $r = \frac{10}{3 + 2\cos\theta}$

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

Exam.	Back		
Level	BE	Full Marks	40
Programme	BAR	Pass Marks	16
Year / Part	I / I	Time	1 ½ hrs.

Subject: - Introduction to Architecture *(AR 402)*

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

1. Define built environment and explain it taking reference of Sigrried Giedion concepts. [1 0]
2. Define architecture and how it differs from engineering. [1 0]
3. How technology and material context influences architecture? [1 0]
4. What are the career opportunities of architecture profession and explain its interactive relationship with allied professionals such as planners, interior, designers, engineers and urban designers? [1 0]
5. Write short notes on: (Any Two) [2× 5]
   a) Building bye laws
   b) Light plane
   c) Set back

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BAR	Pass Marks	16
Year / Part	I / I	Time	1½ hrs.

Subject: - Introduction to Architecture *(AR 402)*

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

1. What do you understand through your study of Temple/Monastery architecture in Nepal? Write in detail considering the built environment aspects. social, religious and cultural aspect, material and technological aspects.
2. Discuss the need of interaction of architects with allied professionals such as planners, structural engineers, interior designers and landscape architects.
3. Taking any appropriate traditional building of your choice in Kathmandu Valley, discuss how the cultural and religious character of the society has influenced its architecture. Write about the construction materials, their use and technology at that time of history.
4. Write short notes on: (Any Two)
   a) Green building
   b) Relationship of Architect with client and contractor
   c) Floor area ratio

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
Level	BE	Full Marks	40
Programme	BAE	Pass Marks	16
Year / Part	I / I	Time	1 ½ hrs.

Subject: - Introduction to Architecture *(AR 402)*

- ✓ 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. Write on Socio-cultural and religious impacts on Architecture.
2. What is built environment explain.
3. What is meaningful role of history in context of architecture?
4. What do you understand about professional society? What is its role?
5. Write about career opportunities for architects in Nepal.

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83 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	B.Arch.	Pass Marks	16
Year / Part	I / I	Time	1 ½ hrs.

Subject: - Introduction to Architecture *(AR402)*

- ✓ 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 built environment? Explain with logic.
2. Elaborate on career opportunities for Nepalese Architects.
3. Write on socio-cultural impacts on Architecture of a place.
4. What is a profession and what are the roles of professional societies?

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83 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	B. Arch.	Pass Marks	16
Year / Part	I / I	Time	1 ½ hrs.

Subject: - Introduction to Architecture *(AR402)*

- ✓ 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. With three basic concepts of space in architecture, discuss relation of architecture with built environment? [14]

   OR

   Discuss relation of architecture with ecology, site, and technology and construction material in the context.

2. Describe in brief the beginning of formal architectural education in Nepal till date? [14]
3. Write short notes on: (any three) [4+4+4]
   a) Architectural Profession and relationship with allied professionals
   b) Relationship between Architect, Client and Contractor
   c) Architecture Profession and its career opportunities
   d) Sigfried Giedian's Concept

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FSU-2073

73 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

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

Subject: - Introduction to Architecture *(AR402)*

- ✓ 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. Explain the social cultural and religious context of Kathmandu valley taking consideration of urban settlements and Newari house?
2. "Building is symbolic art of social needs and values of society". Discuss the theme with reference to Egyptian, Roman and Nepalese (Malla Period) examples.
3. Describe the role of architects in the enforcement of municipality and Building Byelaws. What do you understand through the GCR, FAR, Light Plane and built Up Area?
4. "Architect relationship with allied professional as an Team leader". Explain this statement. Considering Planners, Interior designers, Landscape designers and Engineers.

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FSU-2073

73 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	B.Arch.	Pass Marks	16
Year / Part	I / I	Time	1 ½ hrs.

Subject: - Introduction to Architecture *(AR402)*

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

1. Define Architecture and elaborate on development of Architecture since primitive age till now. Is it tangible indicator of anthropological development?
2. Explain the built environment taking basic concepts of Sigfried Giedion?
3. Justify close relationship of Architecture with, Technology, Techniques, Materials, Site and Ecology of a place.
4. What is status of Architectural professional practice in Nepal and what are job opportunities? Should architects be governed by Nepal Engineering Council Code of ethics?

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FSU PULCHOWK

73

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

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

Subject: - Introduction to Architecture *(AR402)*

- ✓ 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 architecture? Explain it in the context of function, form and science by giving examples.
2. Why context is important in Architecture. Explain the important aspect of city context in Architecture.
3. Write a brief essay on the technology and material context of Architecture.
4. Write short notes on: (any two)
   a) Architects and Planners
   b) Engineer's and Planner's role in Architectural production
   c) Profession of Architecture in Nepal

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FSU-2073

73 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	B. Arch.	Pass Marks	16
Year / Part	I / I	Time	1½ hrs.

Subject: - Introduction to Architecture *(AR402)*

- ✓ 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 Architecture by briefly tracing its development from the beginning to present time.
2. Describe the relationship between Architecture and built environment with suitable example.
3. Write a brief essay on the socio-cultural context of Architecture.
4. Write short notes on: (any two)
   a) Site and city context of Architecture
   b) Client and contractor
   c) Career opportunity in architecture

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FSU PULCHOWK

73 TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

Examination Control Division

2070 Ashad

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

Subject: - Introduction to Architecture *(AR402)*

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

1. Discuss how architecture reflects social needs, values and organization with examples.
2. Discuss how site, environment and ecology contextualize architecture.
3. Discuss career opportunities of architects in private and public sector in Nepal.
4. Write short notes on: (any two)
   a) Architectures as sculpture
   b) Influence of Materials in Architecture
   c) Architecture and allied building professionals

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FSU PULCHOWK

73 TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

Examination Control Division

2069 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	B.Arch	Pass Marks	16
Year / Part	I / I	Time	1½ hrs.

Subject: - Introduction to Architecture *(AR402)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **Three** questions. **Question No. 1 is compulsory.***
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1 Q.N.1. What do you understand through your study of Temple/Monastery architecturally important site in Nepal? Write in detail in following aspects:
Built environment Aspect,
Social, religious & cultural Aspect
Material & Technology Aspect
And Site, City and Ecological Context (5+5+6)

2 **"Building is symbolic art of social needs and values of society".** Discuss the theme with reference to Egyptian, Roman and Nepalese (Malla Period) examples. (4+4+4)

3 Describe the role of architects in the enforcement of municipality and Building Byelaws. What do you understand through the **GCR, FAR, Light Plane and built Up Area?** (4+4+4)

4 Write Short Notes (Any Three) (4+4+4)

A. Architectural Profession and relationship with allied professionals

B. Relationship between Architect, Client & Contractor

C. Architecture Profession and its career opportunities

D. Sigfried Giedian's Concept

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FSU PULCHOWK

1. **Discuss how architecture reflects social needs, values and organization.**

2. **Discribe how site, environment and ecology contextualize architecture.**

3. **Discuss career opportunities of architects in private and public sector in Nepal**

4. **Write short notes on any two of the following:**
   - **(a) Architecture as sculpture**
   - **(b) Influence of Materials in Architecture**
   - **(c) Architecture and allied building professionals**

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FSU PULCHOWK

73R TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

Examination Control Division

2069 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	B.Arch.	Pass Marks	16
Year / Part	I / I	Time	1½ hrs.

Subject: - Introduction to Architecture *(AR402)*

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

1. **Discuss the primary concepts of space in architecture - (i) architecture as a sculpture and (ii) architecture as interior space.**

2. **Taking the case of Nepali traditional architecture, show the influences of materials on architecture**

3. **Discuss the need of interaction of architects with allied professionals such as planners, structural engineers, interior designers and landscape architects.**

4. **Write short notes on any two of the following:**

   (a) **Industrial materials and architecture**

   (b) **Architecture and building bye-laws**

   (c) **Social responsibility of architects**

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FSU PULCHOWK

1. **Discuss the primary concepts of space in architecture - (i) architecture as a sculpture and (ii) architecture as interior space.**

2. **Taking the case of Nepali traditional architecture, show the influences of materials on architecture**

3. **Discuss the need of interaction of architects with allied professionals such as planners, structural engineers, interior designers and landscape architects.**

4. **Write short notes on any two of the following:**

   (a) **Industrial materials and architecture**

   (b) **Architecture and building bye-laws**

   (c) **Social responsibility of architects**

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FSU PULCHOWK

73 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	B. Arch.	Pass Marks	16
Year / Part	I / I	Time	1½ hrs.

Subject: - Introduction to Architecture *(AR 402)*

- ✓ 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. With reference to your study of a temple or a monastery or any other architecturally important structure in Nepal, describe it's socio-cultural, religions, material and technology aspects. [4+4+4]
2. Describe and discuss the relationship of architects with allied profession and the caver opportunities for architects in both public and private sector in Nepal. [4+4+4]
3. Write short notes on: (any four) [4×4]
   a) Sigfried Giedian's second concept of built environment
   b) Building and ecology
   c) Relationship between client, architect and contractor
   d) Architecture study in Nepal
   e) FAR, light plane, GCR and set back

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73 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2067 Ashadh

Exam.	Regular/Back		
Level	BE	Full Marks	40
Programme	B.Arch.	Pass Marks	16
Year / Part	I / I	Time	1½ hrs.

Subject: - Introduction to Architecture

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **Three** questions. **Question No. 1 is compulsory.***
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Make sketches to illustrate your answers.*
- ✓ *Assume suitable data if necessary.*

1. Taking any one appropriate building of Kathmandu valley, describe in detail how socio-cultural and religious aspects, building materials, and adopted construction technology influenced the architectural development of that period. [4+6+6]
2. "Architecture has a societal objectivity and societal responsibility", discuss in this theme with appropriate examples. [12]
3. Describe in brief about the interactive relationship of Architects with their allied professions, and also towards clients and contractors. [6+6]
4. Write short notes on: (any two) [6×2]
   a) Architecture as interior space
   b) Architecture career in private sector
   c) Building Bye-laws

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

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

Subject: - Building Materials I *(AR 403)*

- ✓ 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 chemical classification of stone. Discuss the process of quarrying by hand. [5+3]
   b) Describe dressing of stones. [4]
2. a) What do you mean by good brick earth? [6]
   b) Describe how the following tests of bricks are carried out? [4]
      (i) Water absorption
      (ii) Efflorescence
3. a) Differentiate between Hydraulic lime and Fat lime. [5]
   b) How does sand function in mortar? [4]
4. a) Describe the manufacturing process of cement with a flow diagram by dry process. [8]
   b) Discuss batching of ingredients for the preparation of concrete. [4]
5. Explain testing procedure of Ordinary Cement. [4]
6. What is workability of concrete? How is workability affected by water cement ratio? Describe curing of concrete in construction site. [4+3+6]
7. Write short notes on: [4×5]
   a) Natural drying process of bricks
   b) Concrete Admixtures
   c) Slump Test and Cube Test
   d) Preservations of stones

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

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

Subject: - Building Materials I *(AR 403)*

- ✓ 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 points to be considered for site selection in quarry of stone? [5]
   b) What is quarry sap and what are the reasons for decay and deterioration of stone? [2+5]
2. a) Explain burning of brick in Bull's trench Kiln. [6]
   b) What are the characteristics of a good brick used in engineering construction? [5]
3. a) Write various uses of Lime with appropriate examples. [4]
   b) What are the characteristics of good sand? Write about bulking of sand? [2+2]
4. a) Explain briefly about different types of cement? [6]
   b) Explain in brief about dry process of cement manufacture? Write it's advantages over wet process. [6+3]
5. a) Write about quality of water to be used in concrete? What is the function of water in concrete mix? [2+2]
   b) What is workability of concrete? How can it be tested? [2+5]
   c) Explain about bleeding of concrete. [3]
6. Write short notes on: (Any Four) [4×5]
   a) Function of sand in mortar.
   b) Moulding of brick
   c) Blasting
   d) Coarse and fine aggregate
   e) W/C ratio
   f) Dressing of stone

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

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

Subject: - Building Materials I *(AR 403)*

- ✓ 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) Explain geological classification of stone in brief. [6]
   b) What are the common use of stone on construction? [3]
   c) What are the physical properties of rock? [3]
   d) Discuss about the natural bed of stone. [4]
2. a) What are the characteristics of good brick? [6]
   b) Explain the method of manufacturing of bricks. [10]
3. a) What is slaking of lime? How do you perform it? What is bulking of sand? Write its importance. [4+2+2]
   b) What are the properties of cement motar? Explain its types and uses. [8]
4. a) What is a workability of concrete? Discuss the slump test. [3+3]
   b) Describe how the curing of concrete is done through different method. [10]
5. a) What are the physical properties of cement? [4]
   b) Explain in detail, the manufacturing process of cement by dry process. [12]
6. Write short notes on: [4×4]
   a) Differentiate between stone masonary and brick masonary
   b) Distinguish between fat lime and hydraulic lime
   c) Differentiate between PC and RCC
   d) Moulding of Bricks

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82 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

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

Subject: - Building Materials I *(AR403)*

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

1. a) What are the types of rocks by their physical properties? Discuss about the Freezing and thawing Test and Attrition Test procedure of stone. [5+4]
   b) Discuss about the seasoning and preservation techniques of stone. [4]
2. What are the classifications of burnt bricks? Describe the water absorption and compressive strength lab test of brick. [4+6]
3. Differentiate between fat lime and hydraulic lime? Discuss about the storage of cement. [6+3]
4. Describe the manufacturing process of cement with neat sketches and flow diagram by dry process. [8]
5. Discuss about the classification of sand? What is bulking of sand? [3+4]
6. a) What are the properties of Concrete in plastic stage? Describe the water cement ratio of concrete. [6+4]
   b) What are the properties of Ordinary Portland Cement? Discuss about the following tests for O.P.C: (i) Fineness (ii) Soundness [3+4]
7. Write short notes on: (Any four) [4×4]
   a) RCC
   b) Pug mill
   c) Comparison between stone and brick masonry
   d) Batching of Ingredients for Concrete
   e) Limestone

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82 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Chaitra

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

Subject: - Building Materials I *(AR403)*

- ✓ 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 various types of rocks according to general structure? [4]
   b) Explain the process of quarrying by blast? [6]
2. a) What are the chief ingredients of good brick earth? Explain briefly. [5]
   b) How are the following tests for bricks carried out? [5]
   (i) Water obsorption
   (ii) Efflorescence
3. a) Write down the properties and uses of lime. [5]
   b) What is the Bulking of sand? [5]
4. a) Explain briefly about different types of OPC? [7]
   b) What is the difference between dry and wet process of manufacturing of cement? [5]
   c) What is good cement mortar? [3]
5. a) What are the properties of cement concrete in plastic stage? [6]
   b) What are the factors that affect the strength of Cement Concrete? [5]
   c) Explain the placing operation of concrete? [4]
6. Write short notes on any five. [5×4]
   a) Important points to be considered in stone masonry
   b) w / C ratio
   c) Soundness and fineness test of Portland cement
   d) Qualities of first class brick
   e) Importance of RCC in Architecture
   f) Curing of concrete

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82

IBHUVAN UNIVERSITY
INST TE OF ENGINEERING
Examin on Control Division
2072 Chaitra

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

Subject: - Building Material I *(AR403)*

- ✓ 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 understand by the term physical and chemical classification of rock. How is physical classification related to geological classification? [6]
   b) How is the blasting of stone carried out? [4]
   c) What is the importance of dressing of stone? [2]
2. a) Describe briefly What are the chief ingredients of good brick earth? State the harmful ingredients in brick earth. [6]
   b) Explain briefly how the following tests for bricks are carried out. [4]
   i. Compressive strength
   ii. Efflorescence
   iii. Water absorption
3. a) Differentiate between fat lime and hydraulic lime. [5]
   b) Describe about the bulking of sand. [5]
4. a) Briefly explain how cement is manufactured by dry process. [8]
   b) What are the good qualities of Ordinary Portland Cement? [3]
   c) What are the precautions to be taken for storage of cement? [3]
5. a) How can concrete be classified according to proposes to use for construction work? [6]
   b) What are the properties of cement concrete in hardened state? [4]
   c) Explain the curing operation in respect to cement concrete. [4]
6. Write short notes on any five. [5 x4]
   a. Natural bed of stone
   b. Drying of raw bricks
   c. Soundness and tensile strength test of OPC
   d. Slump test
   e. Water cement ratio
   f. Admixtures in cement concrete

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FSU-2073

72 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

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

Subject: - Building Materials I *(AR403)*

- ✓ 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 basic sources of stones found in nature? [8]
   b) Explain the process of quarrying by blasting. [4]
2. a) What are the qualities that a good brick should possess in order to bring out a good architectural effect? [6]
   b) Enumerate the differences between brick and stone masonry. [4]
   c) Write in short about the clamp burning of brick. [4]
3. a) Differentiate between fat lime and hydraulic lime. [5]
   b) Write briefly about the bulking of sand. [4]
   c) What are the substitutes of sand? [1]
4. a) What are the various ingredients of Ordinary Portland Cement? [4]
   b) Describe briefly the dry process of cement manufacturing with flow diagram. [6]
5. a) What are the properties of concrete in hardened stage? [2]
   b) What are the factors that affect the strength of concrete? [6]
   c) Explain the compressive strength and slump test of concrete. [6]
6. Write short notes on: [5×4]
   a) Preservation of stone
   b) Functions of the ingredients of good brick earth
   c) Describe two types of OPC
   d) Water-Cement ratio
   e) Importance of RCC in architecture

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FSU - 2073

72 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

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

Subject: - Building Materials I *(AR403)*

- ✓ 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 basic sources of stones found in nature? What is seasoning of stone? [6+2]
   b) Discuss about the technique of considering natural bed of stone on various construction. [4]
2. What are the advantages and disadvantages of kiln burning of bricks with respect to clamp burring? Write down the characteristics of 'A' class brick. [4+4]
3. Differentiate between Fat lime and Hydraulic lime. [4]
4. a) Describe the manufacturing process of cement with neat sketches and flow diagram by dry process. [8]
   b) What is Ordinary Portland Cement? Write down the properties of High Alumina and Rapid Hardening Cement. [8]
5. Write down the main characteristics of good sand and enumerate the substitutes of sand. [4]
6. a) What are the constituents of Plain Cement Concrete? Describe the water cement ratio of concrete. [3+5]
   b) What is workability of concrete? How can it be tested? [3+5]
7. a) Write down the importance of Market Survey. Explain, how the survey of any three building materials is carried out. [3+7]
   b) What is compressive strength of concrete? Write down the procedure of Tensile strength test of concrete. [3+7]

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FSU
PULCHOWK

FSU-2073

72 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

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

Subject: - Building Material I *(AR403)*

- ✓ 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) Write down the methods of stone quarrying. [6]
   b) How can we preserve the quality of stone? [4]
2. a) What are the main constituents of good brick earth? [6]
   b) What are the qualities of good brick? [4]
3. a) What are the characteristics of Ordinary Portland Cement? [5]
   b) Explain in brief the difference between dry and wet processes for manufacturing of cement. [5]
4. a) How does lime help in bringing out good architectural finish? [5]
   b) What is bulking of sand? [5]
5. a) What are the factors that influence the strength of concrete? [8]
   b) Write down the advantages of RCC in construction works. [6]
   c) What is meant by slump test of concrete? [6]
6. Write short notes on : [5x4]
   a) Storage of Cement
   b) The selection of good stone
   c) Substitution of Sand
   d) Hydraulic Lime

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72 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

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

Subject: - Building Materials I *(AR403)*

- ✓ 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) Enumerate the characteristics of a good building stone. [5]
   b) What are different methods used in dressing of stone? [5]
2. a) Explain briefly the harmful ingredients in good brick earth. [5]
   b) What are the properties of first class brick? [5]
3. a) Describe the manufacturing process of cement with flow diagram by wet process. [7]
   b) Discuss about the following tests for ordinary Portland cement: [8]
      i) Tensile test
      ii) Soundness test
4. a) What are the constituents of Plain Cement Concrete? Describe the water cement ratio of concrete. [3+7]
   b) Explain about the reinforced cement concrete. [5]
5. a) What are the characteristics of good sand? [5]
   b) Explain the functions of sand in mortar. [5]
6. Write short notes on: (any four) [5×4]
      i) Cement mortar
      ii) Slump test of concrete
      iii) Hydraulic lime
      iv) Pug mill
      v) Bulking of sand

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FSU PULCHOWK

72 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Ashad

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

Subject: - Building Material *(AR403)*

- ✓ 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 selection criteria of Building Stone and its uses for engineering works. [5+5]
2. a) What do you mean by good brick earth? [5]
   b) Discuss about the moulding process of bricks. [5]
3. a) Write down the properties and uses of lime. [5]
   b) What are the characteristics of good sand? [5]
4. a) Discuss about the following test for ordinary Portland cement (i) chemical composition (ii) Tensile strength. [7]
   b) What is the difference between dry and wet process? [5]
   c) Explain properties of good cement mortar. [3]
5. a) What are the properties of hardened concrete? [5]
   b) What are the constituents of concrete? Describe the properties of concrete in plastic stage. [3+7]
6. Write short notes on: (any four) [5×4]
   i) Curing
   ii) Quality control of concrete
   iii) W/C ratio
   iv) Importance of building material in architecture
   v) Preservations of stones

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72 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Chaitra

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

Subject: - Building Materials I *(AR403)*

- ✓ 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 meant by dressing of stones? [5]
   b) Explain the geological classification of stone. [5]
2. a) Write down the difference between class A and class B Bricks. [5]
   b) Describe any three laboratory tests for bricks. [5]
3. a) Differentiate between fat and Hydrare lime. [5]
   b) What are the functions of sand in mortar? Write down the substitutes of sand. [5]
4. a) Explain briefly about difference types of cement. [7]
   b) Discuss about the following test for OPC cement. [8]
      i) Fineness test
      ii) Soundness test
5. a) What are the factors that affect proportions of Concrete? [7]
   b) What is guniting? [3]
   c) Write the advantages of RCC. [5]
6. Write short notes on: (any four) [5×4]
   a) Slump test
   b) Placing of concrete
   c) Admixtures
   d) Principle to be observed in stone masonry
   e) Types of cement mortar

FSU PULCHOWK

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72 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Chaitra

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

Subject: - Building Materials I *(AR 403)*

- ✓ 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 main classification of rock. Explain the process of quarrying by hand. [6+4]
2. What are the constituents of good earth brick? Describe how the following tests for bricks are carried out. [5+5]
   a) Compressive strength
   b) Efflorescence
   c) Water absorption
3. Differentiate between hydraulic lime and fat lime? [4]
4. How is cement manufactured by dry process? What are the characteristics of Ordinary Portland cement? Write down the precautions to be taken for storage of cement. [7+3+6]
5. What are the characteristics of good sand? [5]
6. What are constituents of concrete? Describe the properties of concrete in plastic stage. How slump test is carried out in site? [4+6+5]
7. Write short notes on: (any five) [5×4]
   a) Dressing of stone
   b) Characteristics of good brick
   c) Compressive strength of cement
   d) Bulking of sand
   e) Transportation and placing of concrete
   f) Curing of concrete

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Baishakh

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

Subject: - Building Material

- 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 basic sources of stones found in nature? Explain the process of quarrying by wedging. [4+6]

OR

What is seasoning of stone? Explain how stones are dressed and preserved before the construction works? [2+8]

2. What is a workability of concrete? Classify concrete and give brief notes on them. Describe different methods of mixing concrete. [2+4+4]

OR

What are the concrete admixtures? Describe how the curing of concrete is done through different methods? [2+8]

3. Write the composition of OPC. Describe the dry process of cement manufacturing with flow diagram. [2+8]

4. What is a bulking of sand? Explain cement with properties and also explain the storage of cement. [2+4+4]

5. What are the qualities that brick should possess in order to bring out a good architectural finish? Write characteristics of good sand. [3+2]

6. Differentiate between fat lime and hydraulic lime. Explain any two types of testing of cement. [4+3+3]

7. Write short notes on: (any four) [4×5]

a) Cement mortar
b) Water cement ratio
c) Classification and uses of sand
d) Special bricks
e) Compressive strength of concrete

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74 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2067 Ashadh

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

Subject: - Building Materials I

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

1. a) What is natural bed of stone? Enumerate the characteristics of good building stone. [10]
   b) State the different processes of formation of stones, according to which these are classified geologically, with the examples of each class. [10]
2. a) What are the different ingredients of Portland cement? Describe their respective functions. [10]
   b) Draw the flow diagram for the manufacture of ordinary cement by dry process and explain the process in short. [10]
3. a) What is concrete? What is slump test of concrete and how it is carried out? [10]
   b) Explain formwork for concrete? How concrete is transported and what are the precautions to be taken during the placing of cement concrete? [10]
4. a) How will you test the quality of brick? What are the constituents of good brick earth? [10]
   b) Distinguish between fat lime and hydraulic lime in respect of their chemical composition, slaking, shrinkage, setting, hardening, strength and uses. Explain clearly. [10]
5. Write short notes on: (any four) [4x5]
   a) Fine and coarse aggregates
   b) Quick hardening cement
   c) Classification of brick
   d) Sieve analysis of sand
   e) Characteristics of good bricks

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