DAYANANDA SAGAR COLLEGE OF ENGINEERING

(An Autonomous Institute Affiliated to VTU, Belagavi)

Department of Civil Engineering

(Question Bank)

Course: Elements of Civil Engineering & Engineering Mechanics

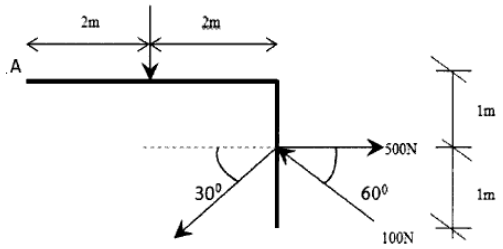
Course Code: 18CV1ICECV

MODULE 1(Introduction to Civil Engg & Engg Mechanics)

1.Mention the different branches Civil Engineering & explain briefly.

2. Replace the force system shown in Fig. with a force and moment at A.

200N



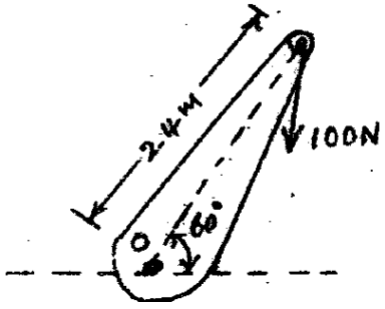
300N

3. A 200N vertical force is applied at the end of a lever which is attached to a shaft as shown in Fig. Determine:

i)The moment of the force about 'O'

ii) The horizontal force applied at 'A' which creates the same moment about 'O'

iii) The smallest force at 'A' that creates the same moment about 'O'



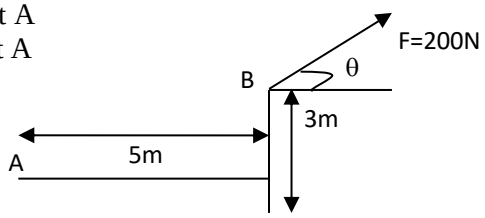
4. What is meant by infrastructure? What are the different types of infrastructure provided forthe development of nation?

5. Define force & its characteristics & also write the difference between Moment and Couple.

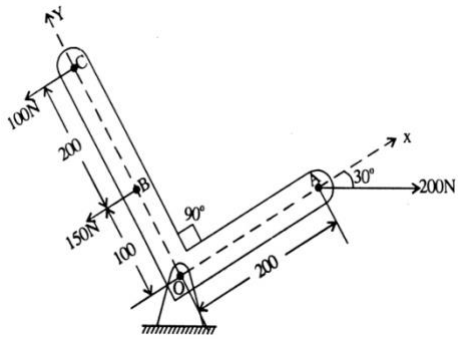
6. Determine the angle θ ($0^o \leq \theta \geq 180^o$) for the Force F = 200N shown in the figure so that it produces:

a) Maximum moment about A

b) Minimum moment about A



7. Three external forces are acting on L-shaped lever as shown in the figure. Determine the equivalent system through O.

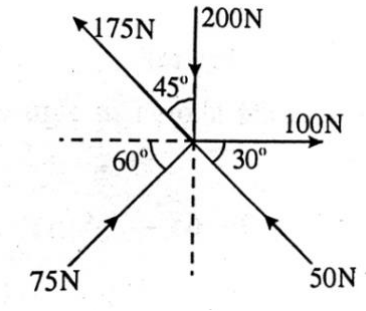


MODULE 2(Concurrent & Non concurrent force system)

1. State and prove Varignon's theorem of moments.

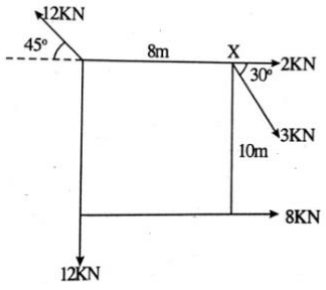
2. Differentiate between Composition & Resolution of force systems. .

3. Find the resultant and its direction for the system of forces shown in the figure.



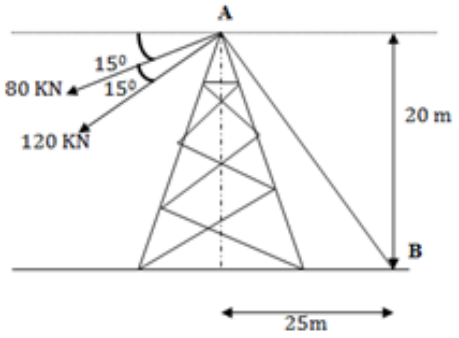
4. Two forces F1 and F2 act on a body. If the magnitude of the resultant is equal to that of F1 and direction perpendicular to F1, then find the magnitude and direction of F2. Take F1 = 20N

5. Find the resultant, magnitude, direction and distance from point X of the force system as shown figure.

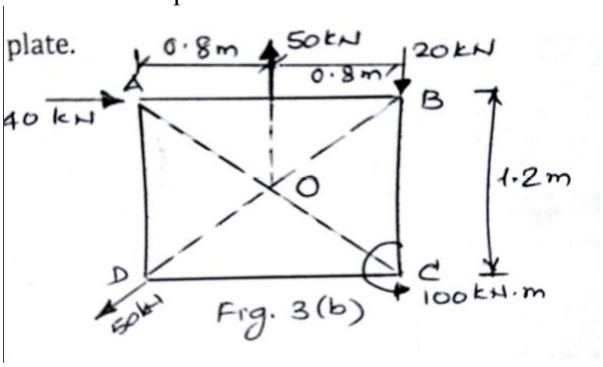


6.Explain the different types of force system.

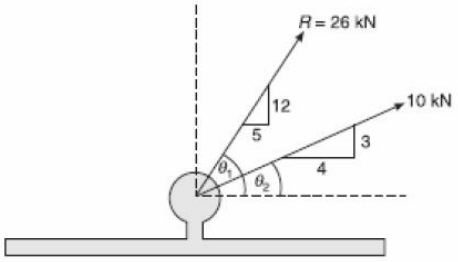
7. An electric transmission tower supports two cables carrying tension of 80KN and 120KN as shown in figure. Determine the required tension in the given wire AB. So that resultant of the forces exerted by three cables will be vertical. Also find the magnitude of resultant.



8. A rigid plate is subjected to forces as shown in Fig.Compute the resultant force and position of resultant force with respect centroid point 'O' of the plate.



9. The 26 kN force is the resultant of two forces, one of which is shown in Fig. Determine the other force.



10. Find the magnitude, direction and position of the resultant for the force system shown in Fig

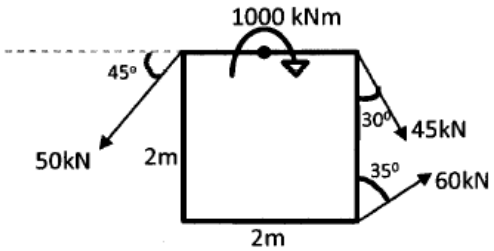


Fig 4(c)

MODULE 3(Equilibrium of forces & Friction)

1.What is a beam? What are the types of beams?

2. Determine the support reactions for the simply supported beam shown in Fig.

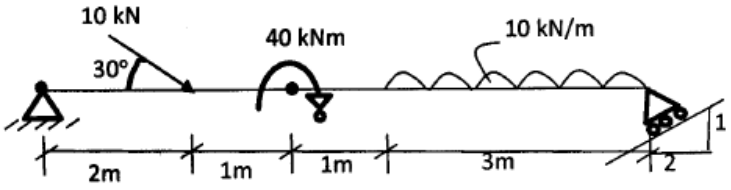
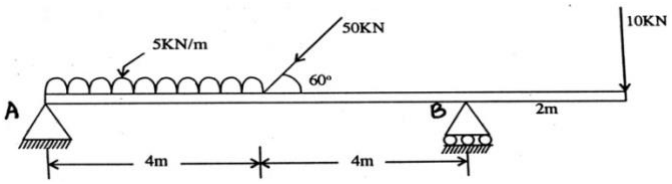


Fig 5(c)

3. State and prove Lami's theorem&Mention its limitations.

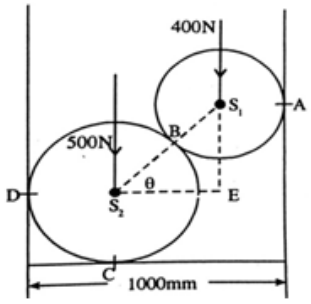
4. Determine the reactions at A & B of the overhanging beam as shown in the fig.



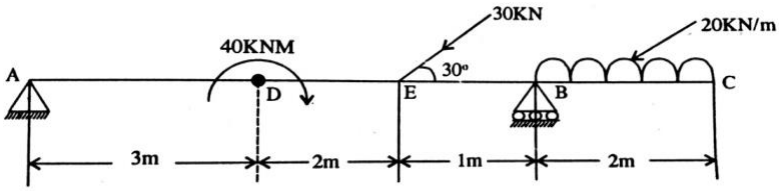
5. Briefly explain the types of friction and also state the Laws of Friction.

6. Explain the different types of loads in the analysis of beams with neat sketches

7. A horizontal channel with an inner clearance of 1000mm carries two spheres of radius 350mm and 250mm whose weights are 500N and 400N respectively as shown in figure. Find the reactions at all points of contact.



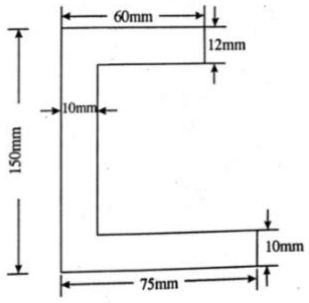
8. Determine the reactions at A and B of the overhanging beam shown in figure.



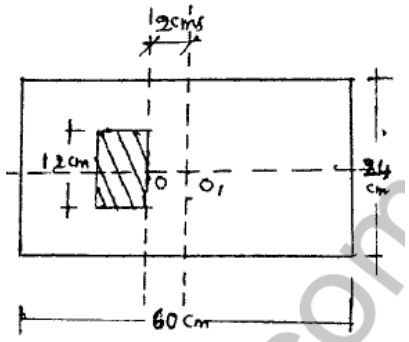
MODULE 4 (Centroid & Moment of Inertia)

1.Determine the centroid of a Triangle, Semi-circular & Quadrant of a circle by the method of integration.

2. Determinethecentroidofthelaminashowninfigure.



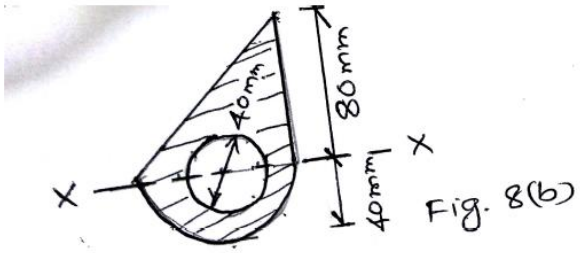
3. The centroid of the rectangular area requires to be shifted from 'O' to 'O1' (2 cms). This is accomplished by removing the hatched portion which is 12 cms deep and symmetrical about X-X axis. Determine the area of the hatched portion shown in Fig.



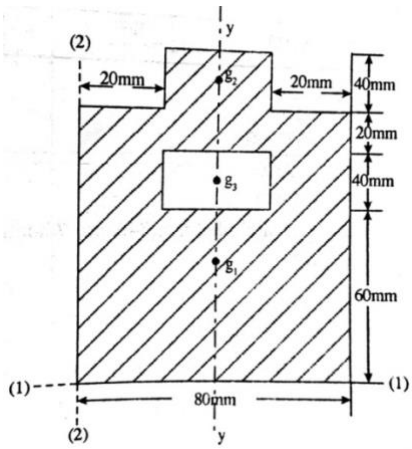
4. State and prove Parallel axis & Perpendicular axis theorem.

5.Explain polar moment of inertia and radius of gyration.

6.Determine the moment of inertia of the shaded area about X-X axis shown in Fig.



7. Determine the centroid of the shaded area and find the moment of inertia about the vertical centroidal axis for the figure.


y
(2)
20mm
20mm
40mm
20mm
40mm
60mm
(1)
(1)
80mm
(2)
y

QUESTION BANK

MODULE I

INTRODUCTION TO CIVIL ENGINEERING AND ENGINEERING MECHANICS

1. Discuss the infrastructure development activities in which civil engineers are involved. **(Dec2014 /Jan 2015, June/July 2013, June 2012)**

2. What are the roles played by Civil Engineers? Explain briefly. **(Dec2014 /Jan 2015)**

3. What is the Civil Engineering infrastructure systems required for the Socio- Economical development of a country?

4. Briefly explain the scope of the different fields of civil engineering.

5. Compare the advantages and disadvantages of roads over other modes of transportation.

6. Write a note on the classification of roads based on various factors.

7. With a neat sketch (cross section) explain the different components of a road. **(Dec2014 /Jan 2015)**

8. Draw a typical sketch of a NH/SH running over an embankment in cutting and in Urban areas.

9. Explain the following with figures

a) Deck bridge b) Through bridges c) Semi-through bridge d) Square & Skew Bridges

10. With neat sketches explain

a) Overflow & non-overflow dams b) Gravity dams c) Buttress dams d) Arch dams **(June 2012)**

11. Define a) Particle b)Continuum c)Point Source

12. Differentiate between a rigid body and deformable body.

13. List the basic assumptions in Mechanics.

14. State a) Principle of Physical independence of forces

b) Principle of superposition of forces. **(June 2012)**

15. What are the characteristics of a force? Explain with two examples. **(Dec2014 /Jan 2015, June2012, June 2014)**

16. Give the difference between Earthen Dams and Gravity Dam.

17. Explain different types of dams, with neat sketches

18. Explain the different force systems with figures and suitable examples.

19. State the different Newton's' laws of motion.

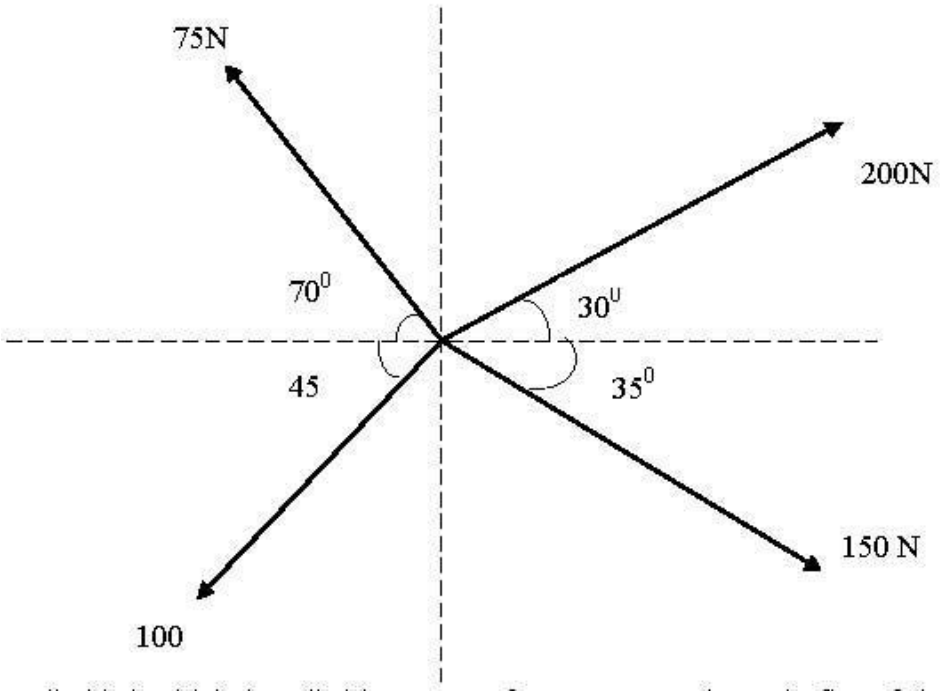
20. What is a couple? List its characteristics.

MODULE II

COPLANAR CONCURRENT AND NON CONCURRENT FORCE SYSTEM

1. Distinguish between Resolution and Composition of forces.

2. Determine the magnitude & direction of the resultant of the coplanar concurrent force system shown in figure below.

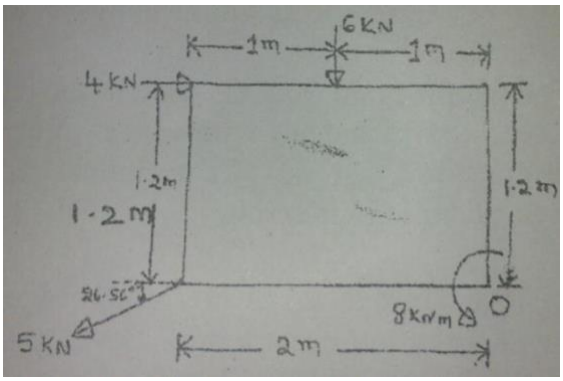


3. State and prove Varignon's theorem of moments.

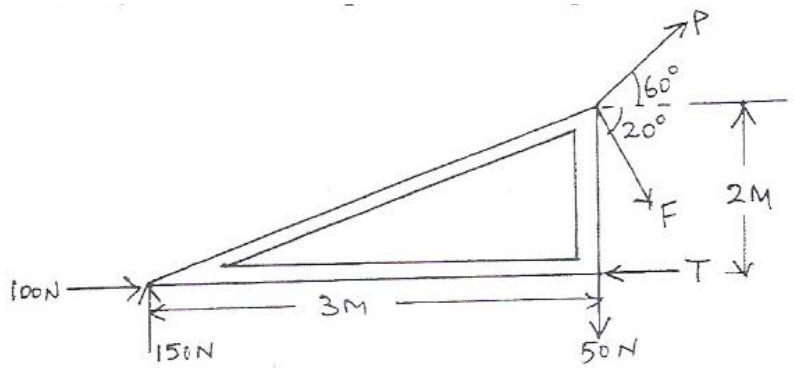
4. State and prove parallelogram law of forces.

5. Explain the principle of resolved parts.

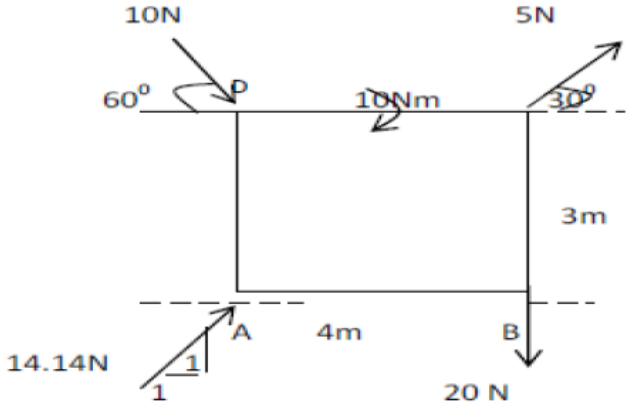
6. Determine the magnitude, direction of the resultant force for the force system shown in fig. Determine the X intercepts of the resultant force with respect to the point O.



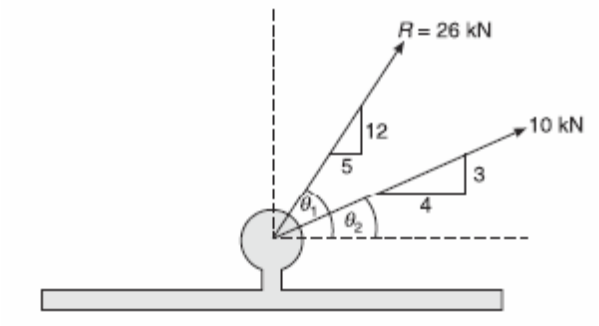
7. Determine the forces P, F and T required to keep the frame in equilibrium



8. Determine the resultant of the force system acting on the plate. As shown in figure given below with respect to AB and AD.



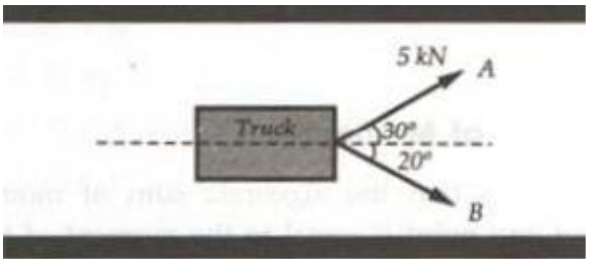
9. 26kN force is the resultant of the two forces, one of which is as shown in fig. Determine the other force.



10. A truck is to be pulled along a straight road as shown in fig.

(i) If the force applied along rope A is 5kN inclined at 30^0, what should be the force in the rope B, which is inclined at 20^0, so that vehicle moves along the road?

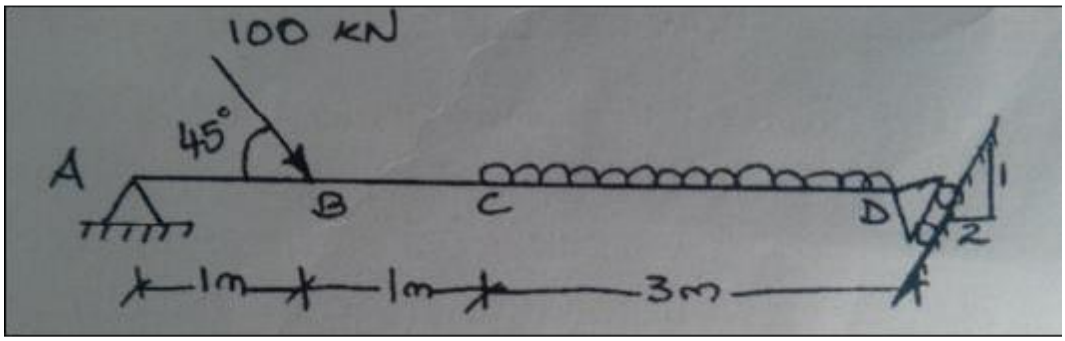
(ii) If force of 4kN is applied in rope B at what angle rope B should be inclined so that the vehicle is pulled along the road?



MODULE III

EQUILIBRIUM OF FORCES AND FRICTION

1. For the beam with loading shown in Fig. determine the reactions at the supports.



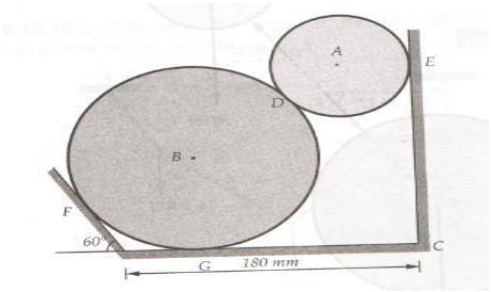
2. State and prove Lami's theorem

3. A ladder of length 4m weighing 200N is placed against a vertical wall as shown in fig. The coefficient of friction between wall and the ladder is 0.2 and that between the floor and the ladder is 0.3. the ladder in addition to its own weight has to support a man weighing 600N at a distance of 3m from A. Calculate the minimum horizontal force to be applied at A to prevent Slipping.

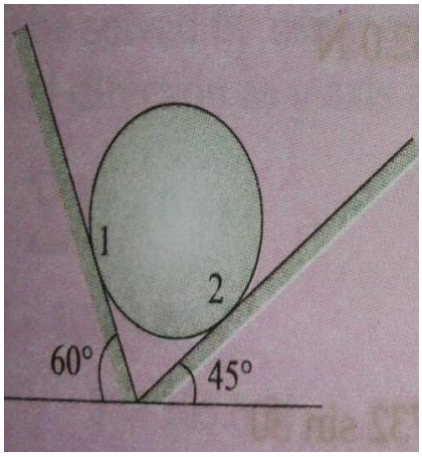
4. A ladder of length 5m rests against a vertical wall, with which it makes an angle of 45°. The co-eff. of friction between the ladder and the wall is 0.35 and that between the ladder and the ground is 0.5. If a man whose weight is one half of the ladder ascends the ladder, how high will he be when the ladder slips?

5. State laws of friction

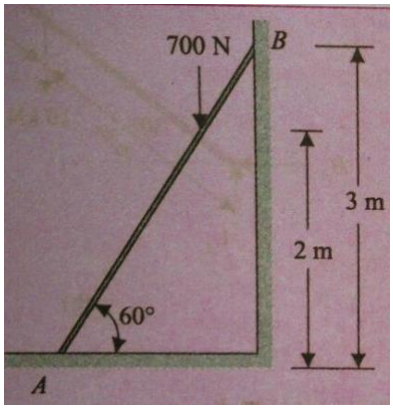
6. Two cylinders A and B rest in a channel as shown in fig. A has a diameter of 100mm and weighs 20 kN, B has diameter of 180 mm and weighs 50kN. The channel is 180mm wide at bottom with one side vertical and the other side at 60^0 inclinations. Find the reactions at contact points.



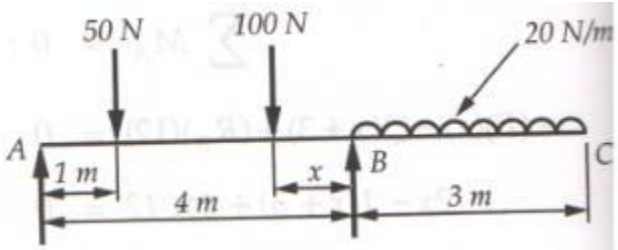
7. A 200 N sphere is resting in at rough as shown in fig. determine the reactions developed at contact surfaces. Assume all contact surfaces are smooth.



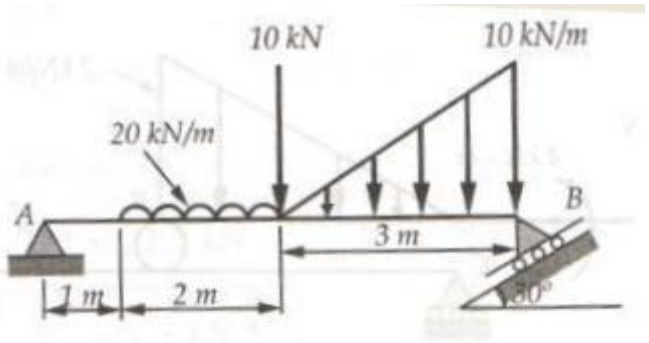
8. A ladder weighing 100N is to be kept in the position shown in figure. Resting on a smooth floor and leaning on a smooth wall. Determine the horizontal force required at floor level to prevent it from slipping when a man weighing 700 N is at 2 m above floor level.



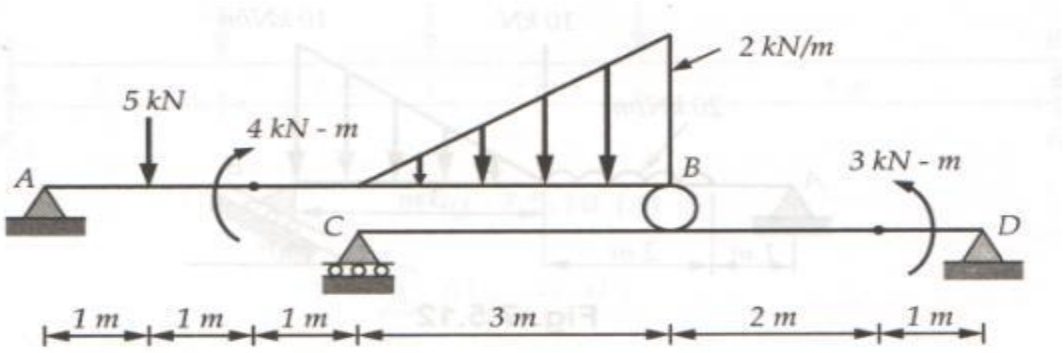
9. Determine the position of 10 N load on the beam such that reactions at the supports are equal for the beam loaded as shown in fig.



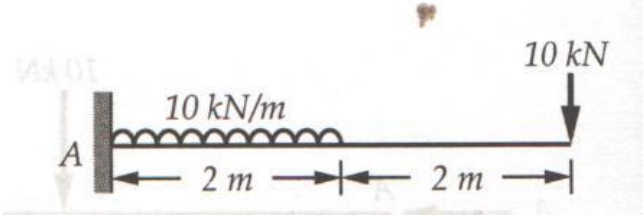
10. Determine the reactions at the supports for the beam loaded as shown in fig.



11. Determine the reactions at the ends of the beam AB and CD as shown in fig. Neglect the self weight of the beams.

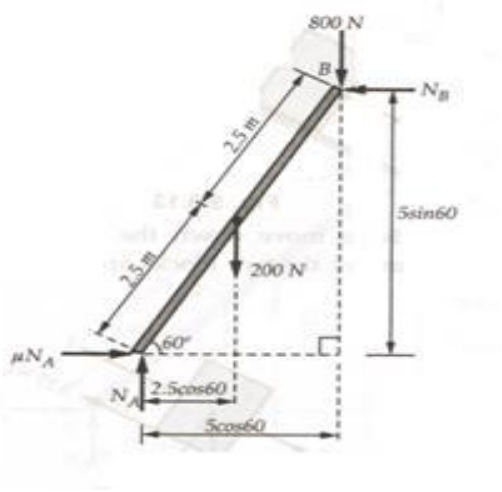


12. Find reactions for a cantilever beam shown in the figure.

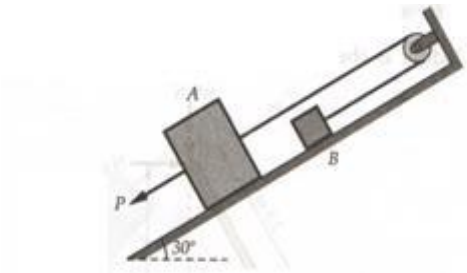


13. Explain Different types of supports? (**Jan, July2013)**

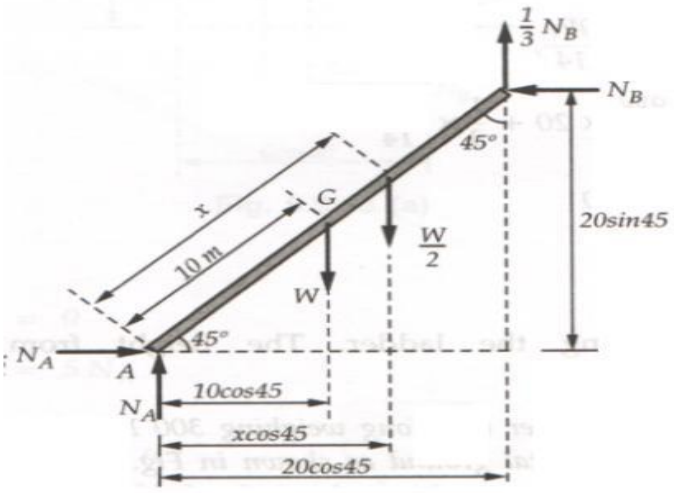
14. A ladder 5m in length is resting against a smooth vertical wall and a rough horizontal floor. The ladder makes an angle of 60^0 with the horizontal. When a man of weight 800N is at the top of the rung, what is the coefficient of friction required at the bottom o the ladder and the floor such that the ladder does not slip? Take the weight of the ladder as 200N. **(Jan/Feb 2012)**



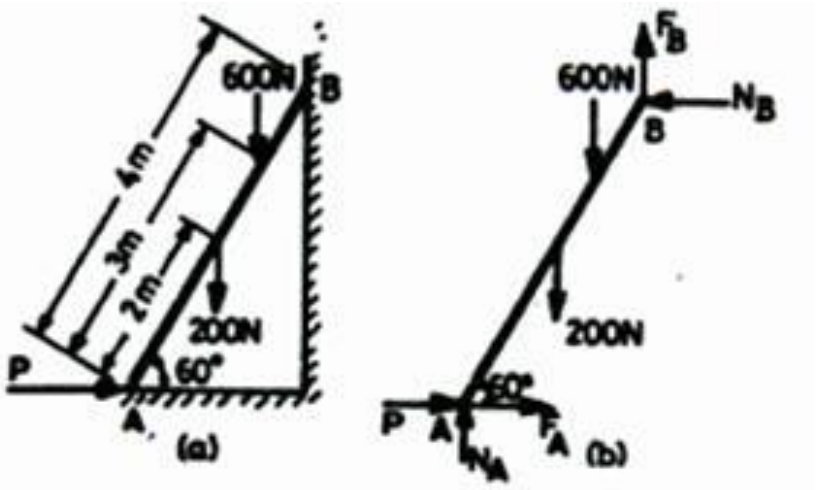
15. Determine the force P required to cause motion of blocks to impend. Take the weight of A as 90N and weight of as 45 N. Take the coefficient of friction for all contract surfaces as 0.25 as in figure. Consider the pulley being frictionless.



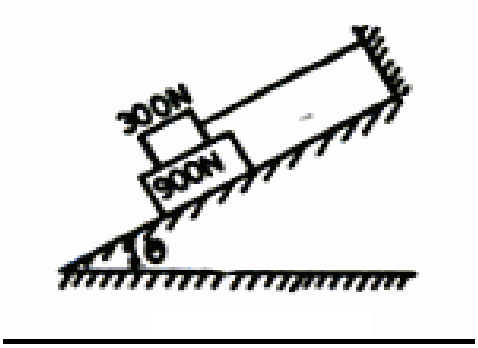
16. A uniform ladder of length 20m, rests against a vertical wall which it makes an angle of 45^0, the coefficient of friction between the ladder and the wall and ground respectively being 1/3 and ½. If a man, whose weight is one half of the ladder, ascends the ladder, how high will he be, when the ladder slips?



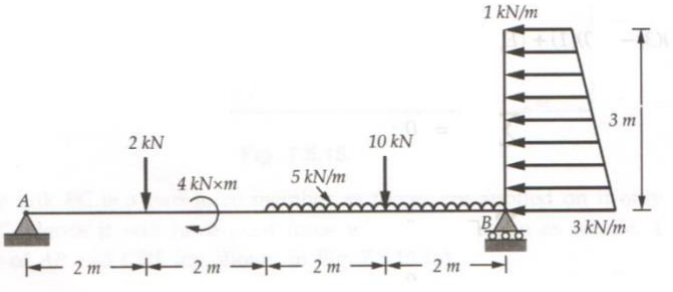
17. A ladder of length 4m weighing 200N is placed against a vertical wall as shown in fig. The coefficient of friction between wall and the ladder is 0.2 and that between the floor and the ladder is 0.3. the ladder in addition to its own weight has to support a man weighing 600N at a distance of 3m from A. Calculate the minimum horizontal force to be applied at A to prevent Slipping.



18. What should be the value of 'ɵ' in fig. Which will make the motion of 900 N block down the plane to impend? The coefficient of friction for all contact surfaces is 0.33.



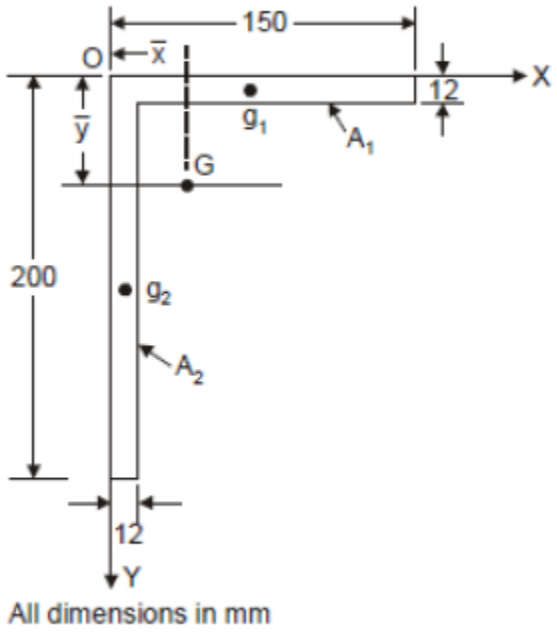
19. Find reactions for a beam shown in the figure.



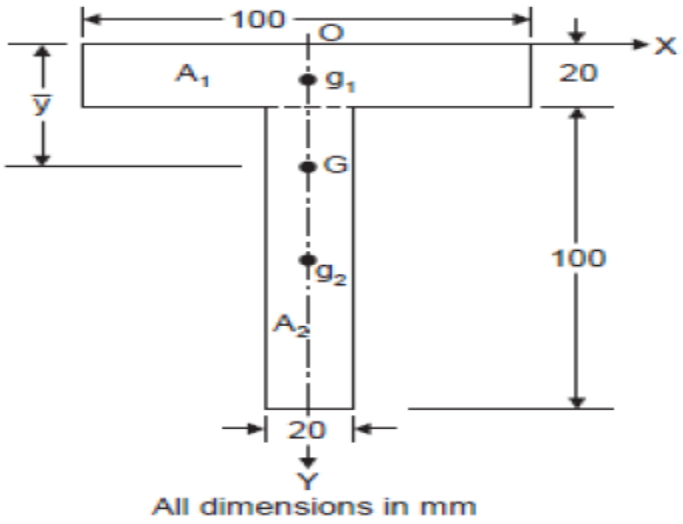
MODULE V
CENTROID AND MOMENT OF INERTIA

Centroid

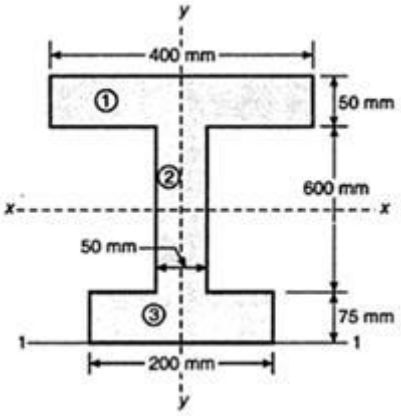
1. Distinguish between Centroid and Center of Gravity.
2. Define Centroid and Centroidal axis.
3. Derive an expression for coordinates for the position of Centroid of a rectangle.
4. Locate the Centroid of a Triangle from first principle.
5. Locate the position of Centroid of a Semi-circular lamina.
6. Locate the position of Centroid of a Quarter circle of radius R.
7. Find the centroid of the unequal angle 200 ×150 × 12 mm, shown in Fig.



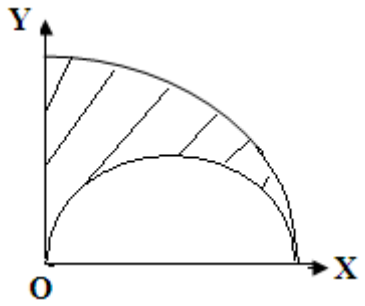
8. Locate the centroid of the T-section shown in fig.



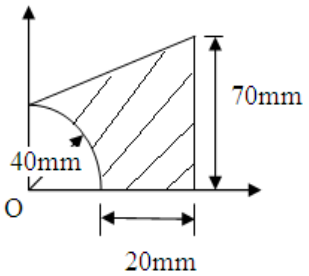
9. Find the moment of inertia along the horizontal and vertical axis passing through the centroid of a section shown in fig.



10. Find the centroid of the shaded area shown in fig, obtained by cutting a semicircle of diameter 100mm from the quadrant of a circle of radius 100mm. **(Jan 2011)**



11.Determine the centroid of the lamina shown in fig. wrt O.



Moment of Inertia

1. Derive an expression for the centroidal axis by using Parallel axis Theorem.
2. Derive an expression for the centroidal axis by using Perpendicular axis Theorem .
3. Derive an expression for the Moment of Inertia Of the triangle about the centroidal y-axis?
4. Derive an expression for the Moment of Inertia Of the Circle about its Diametrical axis?
5. Find the Moment of Inertia along the horizontal axis and vertical axis passing through the centroid of a section shown in figure 1.
6. Find the Moment of Inertia along the horizontal axis and vertical axis passing through the centroid of a section shown in figure 2.
7. Find the Moment of Inertia along the horizontal axis and vertical axis passing through the centroid of a section shown in figure 3.
8. Find the Moment of Inertia along the horizontal axis and vertical axis passing through the centroid of a section shown in figure 4.

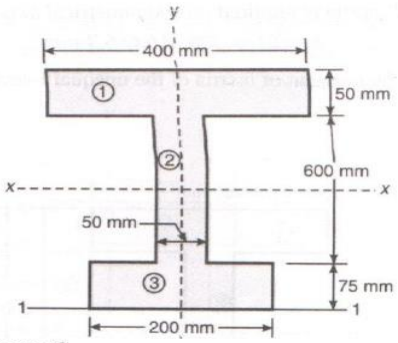


Figure1

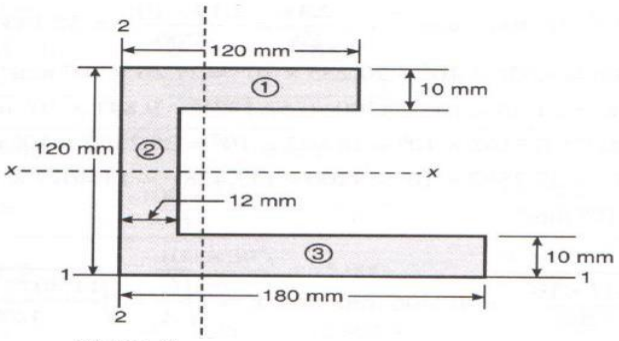


Figure 2

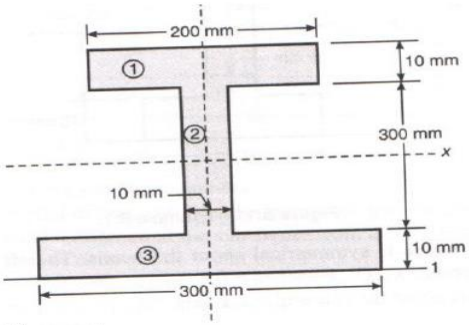


Figure 3

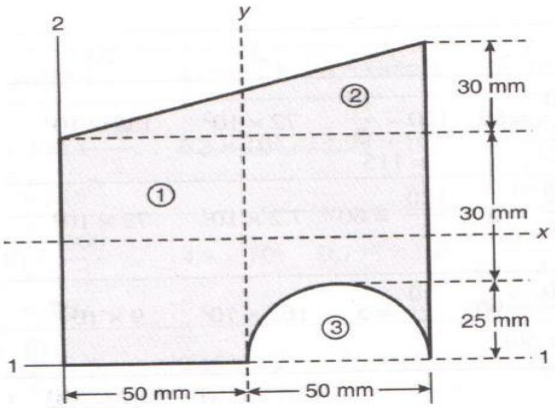


Figure 4

MODULE V
KINEMATICS

1. What is centrifugal force? What is super elevation? **(Dec2014 /Jan 2015)**
2. Determine the position at which the ball is thrown up the plane will strike the inclined plane as shown in fig. the initial velocity 30m/s and angle of projection is Tan^{-1}(4/3) with horizontal. **(Dec2014 /Jan 2015)**
3. A stone is dropped from the top of the tower 50m high. At the same time another stone is thrown up from the tower with a velocity of 25m/sec . At what distance from the top and after how much time the two stones cross each other? **(Dec2014 /Jan 2015)**
4. What is projectile? Define the following terms briefly)Angle of projection ii) Horizontal range iii) Vertical height iv) Time of fight **(Dec2014 /Jan 2015)**

5. A burglar's car starts at an acceleration of 2m/s2. A police vigilant party came after 5s and continued to chase the burgler's car with a uniform velocity of 20m/s. find the time taken in which the police van will overtake the car. **(Dec2014 /Jan 2015)**