Hall Ticket Number:

Code No. : 12017 BEM

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD
B.E. (CBCS) II-Semester New Examinations, May/June-2018

Basic Engineering Mechanics
(CSE, ECE & IT)

Time: **3** hours Max. Marks: **60**

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

1. A force of 20kN is passing through the points (1, 2) and (2, 5) with reference to Cartesian coordinate system. What is the component of the force in X direction?
2. The resultant force of a general system of forces acting on a body in a plane is zero. What would the state of the body? Comment
3. Write the equilibrium equation of system of parallel forces in plane.
4. What are the characteristics of a moment?
5. In a simply supported truss the members are 5 and joints are 4. Comment on the nature of the structure.
6. State the disadvantage of method of joints.
7. State laws of friction.
8. Define limiting friction and cone of friction.
9. What is the radius of gyration of a circular section of diameter 'D'?
10. State the parallel axes theorem.

Part-B (5 × 8 = 40 Marks)
(All sub-questions carry equal marks)

11. a) Find the distance x along AB, at which a horizontal force of 60N should be applied to hold the uniform bar AB in the position as shown in Fig.1. Bar AB is 12 m long and weighs 140N. The incline and the floor are smooth.

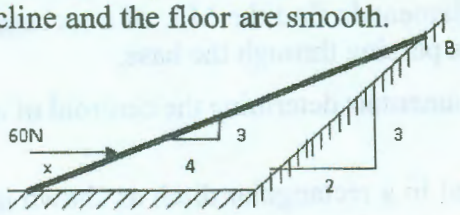

Fig. 1

b) Obtain a moment vector of 100N force acting at (2, 5, 3), passing through (7, 10, 2) about the origin (0, 0, 0).

12. a) Find the reaction at the contact points A, B, C & D if the cylinders are similar with weight 100N each.

b) A 10m bar of negligible weight rests in a horizontal position on the smooth inclines as shown in the figure. Compute the distance x at which the load T = 200N should be placed from point B to keep the bar horizontal.

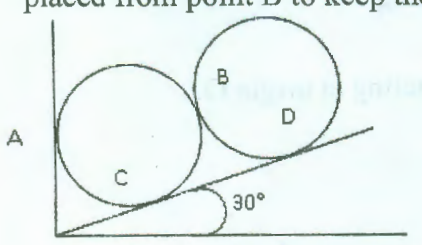

Fig. 2

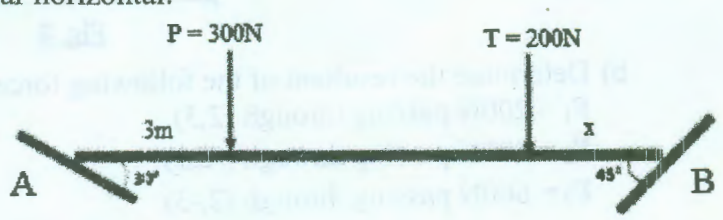

Fig. 3

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13. a) Determine the force in members AB, CD and CE of the truss shown in Fig. 4.

b) Analyze the triangular truss shown in the Fig. 5.

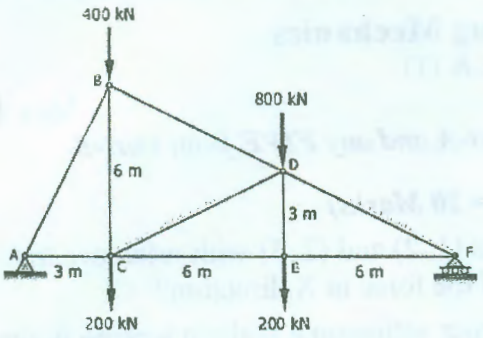

Fig. 4

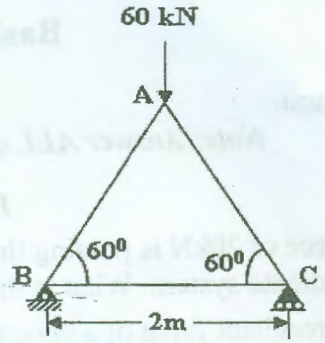

Fig. 5

14. a) In Fig. 6, M1 and M_2 are two masses of 22.5kg and 14 kg respectively. They are tied together by a rope parallel to the plane. The coefficient of friction between M_1 and the plane is 0.25, and between M_2 and the plane it is 0.5. Determine the value of the angle θ at which sliding will occur. What is the tension in the rope?

b) Determine the maximum and minimum force P that holds the system in equilibrium shown in Fig. 7. The belt friction at the pulley A is 0.45 and the same at pulley B is 0.5.

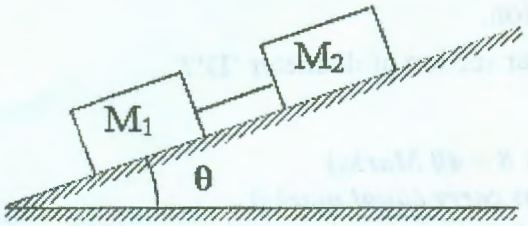

Fig. 6

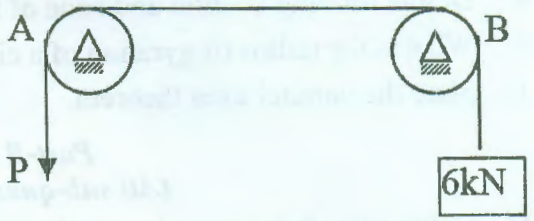

Fig.7

15. a) Starting from the fundamentals find the M.I. of a rectangular section of width 'b' and depth 'd' about an axis passing through the base.

b) Starting from the fundamentals determine the centroid of a semicircular area of radius R.

16. a) Two cylinders are piled in a rectangular ditch as shown in Fig. 8. Neglecting friction, determine the reactions at various contact points.

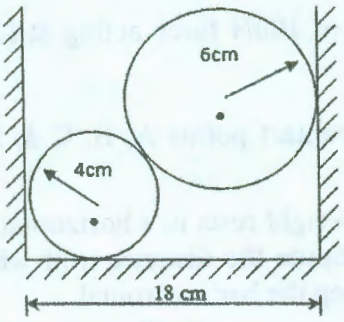

Fig. 8

b) Determine the resultant of the following forces acting at origin O.
F_1 = 200N passing through (2,3)
F_2 = 400N passing through (-2,3)
F_3 = 600N passing through (2,-3)

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17. Answer any ***two*** of the following:

a) Determine the force in members AB, BD, BC, and AC of the truss shown in Fig. 9.

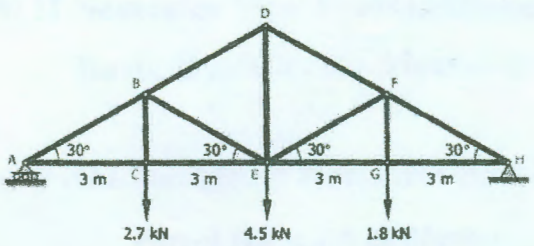

Fig. 9

b) A uniform ladder 3m long weighs 600N. It is placed against a vertical wall at an angle of 60^0 with the ground. How far along the ladder can a 750N man climb before the ladder is on the verge of slipping? Assume angle of friction at all contact surfaces as 15^0.

c) Determine the co-ordinates of the centroid of the shaded portion of the lamina shown in Fig. 10.

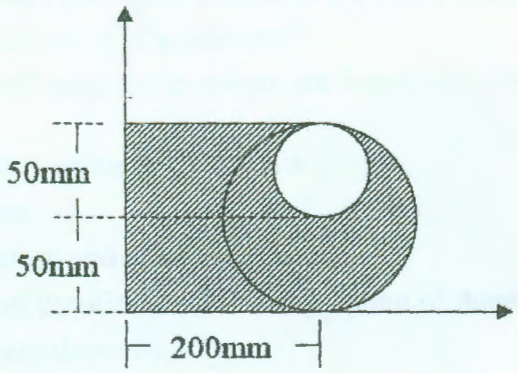

Fig. 10