Hall Ticket Number:

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VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. 1 Year I Semester Supplementary Examinations, June-2017

Engineering Mechanics - I

Time: **3** hours Max. Marks: **50**

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

Part-A (15 Marks)

1. State Law of Transmissibility. [1]
2. A force of 20 N acts at A (2, 3) is directed towards B (4, 2). Another force of 40 N acts at B towards C (4, 6). What is the resultant force? [2]
3. A force of 20 N act at A(2, 4) and directed towards B (4, 6). What is the moment of this force about C (1, 1). [2]
4. Give the equilibrium equations in case of concurrent forces acting in space. [1]
5. In a planar truss the number of joints are 4, the number of members are 10. What should be the number of reactions to make the truss a statically determinate? [2]
6. How many equilibrium equations are used to analyse forces at a joint in a plane truss? [1]
7. Differentiate coefficient of static friction and kinematic friction. [1]
8. A block of 100 N is impending to slide along an inclined plane which makes 35^0 angle with the horizontal plane. What is the coefficient of friction between the plane and the block? [2]
9. Show that for a triangle the centroid lies at $1/3^{rd}$ height from the base of the triangle. [2]
10. What is the Moment of Inertia of a hollow circular section of outer dia 'D' and inner dia 'd' about diametrical axis? [1]

Part-B (5 × 7 = 35 Marks)

11. a) Determine the resultant of the following concurrent forces. [4]

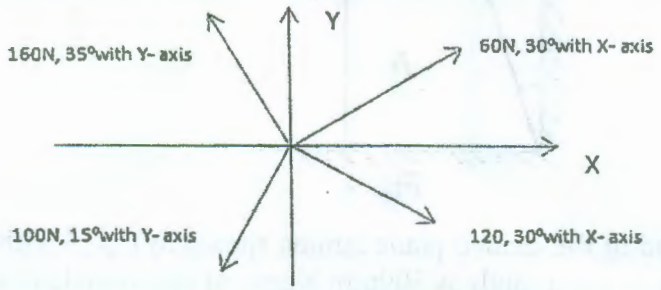

Fig. 1

b) Derive Varignon's theorem and hence verify the same by taking moment of resultant Force of two forces 20 N acting at (2, 3) along positive X axis and 30 N force acting at (2, 3) along positive Y axis about Origin and net moment of the two forces about origin. [3]

12. a) A ladder of weight 200 N and length 4 m rests against a smooth vertical wall and stepped horizontal floor. What is the reaction at the step if the ladder for equilibrium configuration makes 30^0 angle with the horizontal floor? [3]

b) Determine the moment of the following forces about X-axis. [4]

$\overrightarrow{F_{AB}} = 15\hat{\imath} - 20\hat{\jmath} + 35\hat{k}$ *acting at* (2,5,6)

$\overrightarrow{F_{AC}} = 55\hat{\imath} - 40\hat{\jmath} - 25\hat{k}$ *acting at* (2,5,6)

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13. a) Write assumptions in the analysis of trusses. [3]

b) Determine the forces in the members of the truss shown in Fig. 2. Use method of joints. [4]

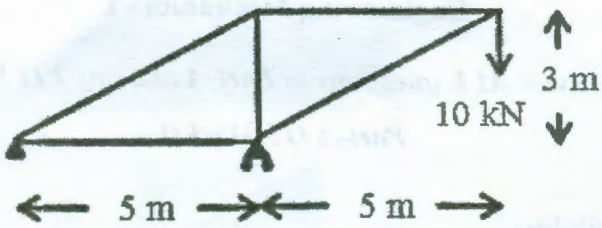

Fig. 2

14. a) Two blocks of same weight 100 N each, are connected by a bar AB are impend to slid along the inclined plane shown in Fig. 3. If the lower block is smooth and the friction between the upper block and contact surface is 0.45, determine inclination of plane and the force in the connecting bar. [4]

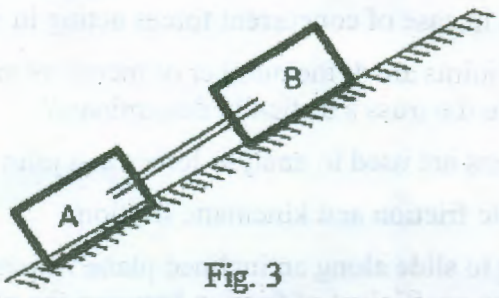

Fig. 3

b) A Vertical force P is applied to move the Block A of weight 1000 N shown in Figure 4. Weight of the block B is 250 N. Inclination of the wedge with vertical is 15^0. The coefficient of friction for all contagious surfaces is 0.35. Determine force 'P'. [3]

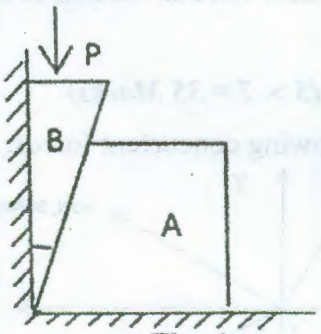

Fig. 4

15. a) Determine the centroid of the shaded plane lamina shown in Fig. 5 with reference to the axes mentioned. Base of the triangle is 300mm height of the triangle is 300mm. Circular cut is three sides of the triangle. [4]

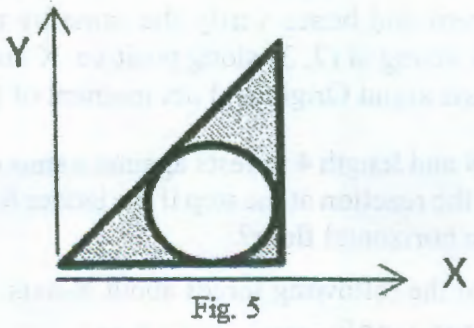

Fig. 5

b) State and prove Pappus theorems. [3]

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16. a) A force $F_1 = 20N$ acting at (4, 5, 6) parallel to Z axis. Force B force $F_2 = 60$ N acting at (4, 5, 6) towards (-4, -4, 6). Determine magnitude and the direction of the equilibrant. [4]

b) Determine the reactions at the contact points of the smooth cylinders A and B shown in Fig. 6. Weight of each cylinder is 100 N. Diameter of each cylinder is 100 mm. [3]

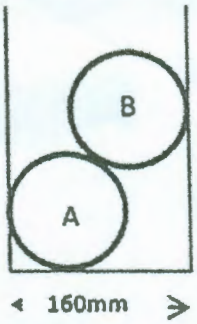

Fig. 6

17. Answer any *two* of the following: [7]

a) Block A weighing 1200 N rests on block B and is tied with horizontal string to the wall. Block B weighs 2400 N. If the co-efficient of friction between all contacts is 0.25, what horizontal force 'P' is necessary to move block B. Fig. 7.

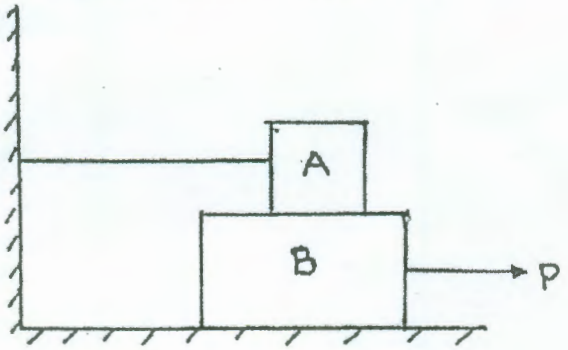

Fig. 7

b) Determine the second moment of area of the shaded portion shown in Fig. 5 about X axis and Y axis.

c) Find the forces in the members CE, EF and FB of the truss loaded as shown in Fig. 8 using method of sections.

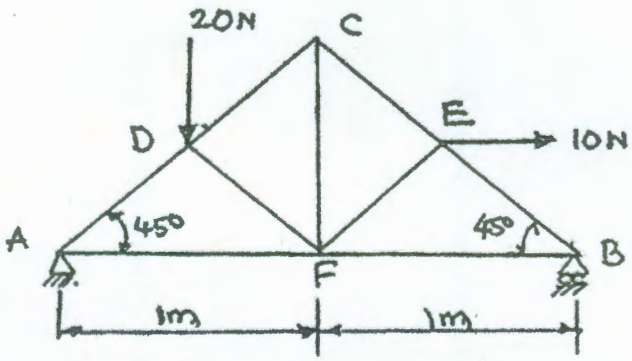

Fig. 8