Hall Ticket Number:

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VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (CBCS) I-Semester Supplementary Examinations, June-2017

Basic Engineering Mechanics

(Civil, E.E.E. & Mech. Engg.)

Time: 3 hours Max. Marks: 70

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

Part-A (10 × 2 = 20 Marks)

1. State and explain parallelogram law.
2. Explain the terms resultant force and moment of a force.
3. Discuss the significance of free body diagram.
4. State the necessary and sufficient conditions of equilibrium for a coplanar system.
5. What is the advantage of method of section over method of joints?
6. Distinguish between perfect frame and redundant frame.
7. From first principles deduce an expression to determine the centroid of a triangle of base 'b' and height 'h'.
8. State and prove parallel axis theorem.
9. Define angle of friction and cone of friction.
10. What are the laws of friction?

Part-B (5 × 10 = 50 Marks)

11. a) Two cylinders are piled in a rectangular ditch as shown in Figure: 1. Neglecting friction, determine the reactions at various contact points. [5]

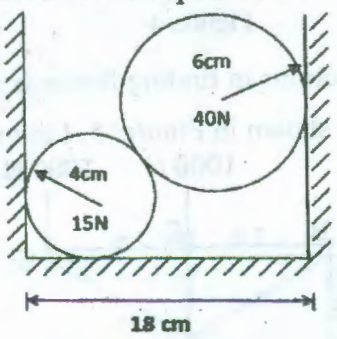

Figure: 1

b) Three bars pinned together at B and C and supported by hinges at A and D as shown in Figure: 2. Form a four-link mechanism, determine the value of 'P' that will prevent motion. [5]

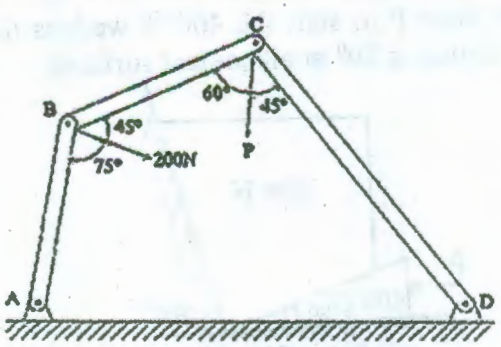

Figure: 2

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12. a) A flat plate is subject to the coplanar system of forces shown in Figure: 3. The inscribed grid with each square having a length of 1cm locates each force and its slope. Find the resultant and its x & y intercepts. [5]

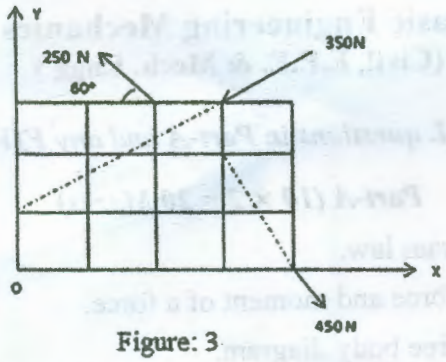

Figure: 3

b) A tension T of magnitude 15 kN is applied to the cable attached to the top A of rigid mast and secured to the ground at B as shown in Figure: 4. Determine moment of the tension T about the Z-axis passing through the base O. [5]

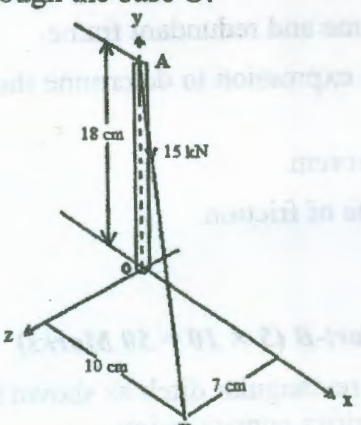

Figure: 4

13. a) How do you use method of sections in finding forces in the members of a truss? [3]

b) A cantilever truss is loaded as shown in Figure: 5. Find the member forces. [7]

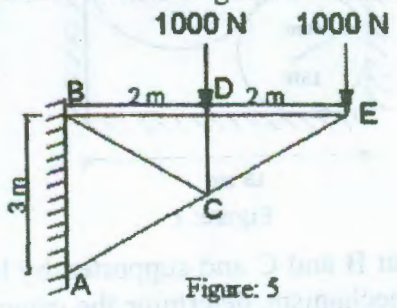

Figure: 5

14. a) Determine the horizontal force P to start the 400 N wedges moving the right shown in Figure: 6. The angle of friction is 20^0 at all contact surfaces. [5]

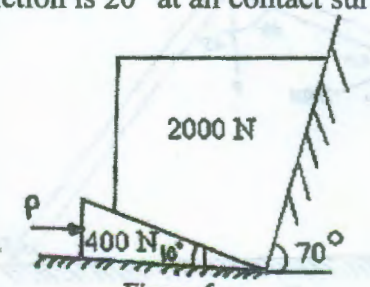

Figure: 6

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b) A block of weight W1 = 1000 N rests on a horizontal surface and supports on top of it another block of weight W2 = 250 N as shown in Figure: 7. The block W2 is attached to a vertical wall by the inclined string AB. Find the magnitude of the horizontal force 'P' applied to the lower block as shown, that will be necessary to cause slipping to impend. The coefficient of static friction for all contact surfaces is $\mu = 0.3$. [5]

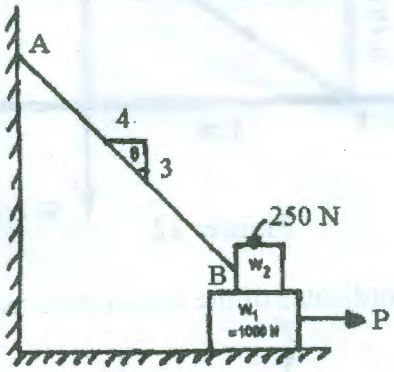

Figure: 7

15. a) Locate the centroid of the shaded area as shown in Figure: 8. [5]

b) Find the moment of inertia of the shaded area shown in Figure: 9 about centroidal axis parallel to horizontal x – axis. [5]

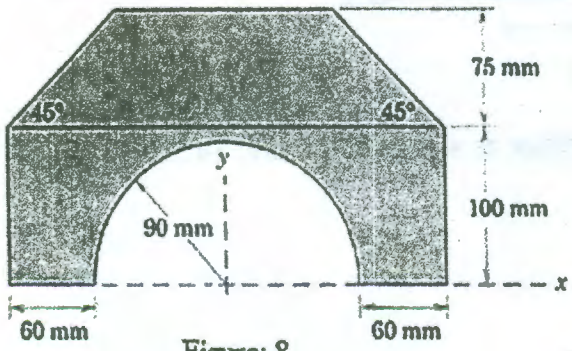

Figure: 8

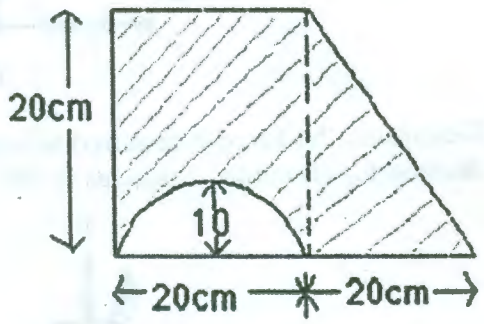

Figure: 9

16. a) For the force system shown in Figure: 10, find the magnitude and direction of the resultant. [5]

b) In the Figure: 11, a boom AC is supported by a ball and socket joint at C and by the cables BE and AD. If the force multiplier of force F acting from B to E is $F_m = 10$ N/m. [5]

(i) find the moment of F about the point C.

() Find the component of F that is perpendicular to the plane DAC.

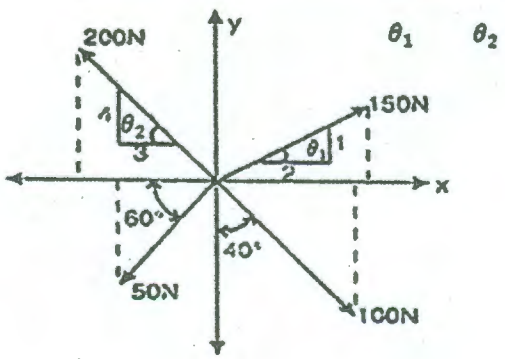

Figure: 10

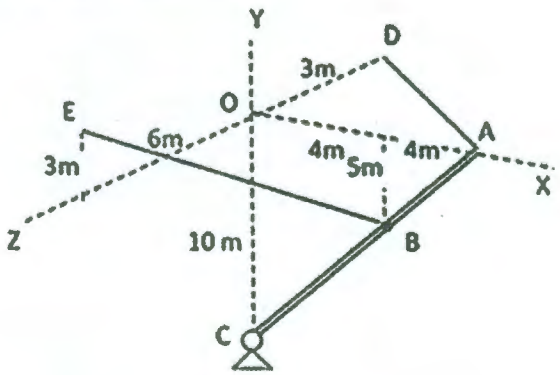

Figure: 11

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17. Answer any *two* of the following:

a) Find the axial forces in all the members of a truss shown in Figure: 12. [5]

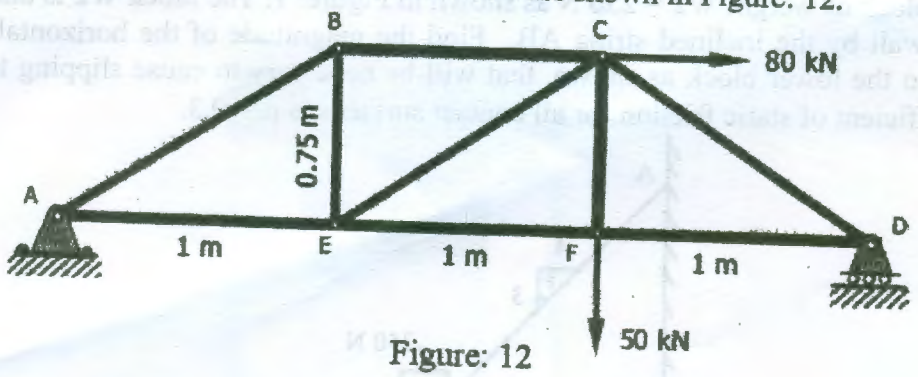

Figure: 12

b) Determine the centroidal co-ordinates of the shaded area as shown in Figure: 13. [5]

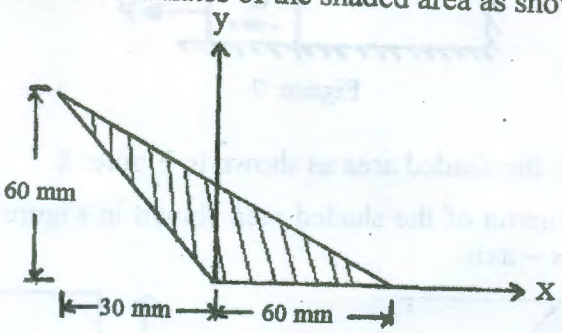

Figure: 13

c) Determine the force P required to start the wedge as shown in Figure: 14. The angle of friction for all contact surfaces is 15^0. [5]

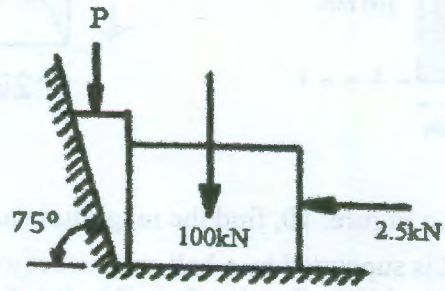

Figure: 14