Code No : 1106

**VASAVI COLLEGE OF ENGINEERING *(Autonomous)* HYDERABAD**

**B.E. I/IV (All Branches) I-Semester(Main) Examinations, Feb.2015**

**Engineering Mechanics-I**

Time: **3** hours Max. Marks: **70**

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

***Part-A (Marks: 10×2=20)***

1. Explain Varignon's Theorem.
2. Explain parallel axis theorem for area moment of inertia.
3. Describe the relationship between the number of joints and number of members in a perfect truss.
4. A force of magnitude 50 kN acts along the line joining A(2,0,6) and B(3, -2, 0). Express the force as a vector.
5. Define the following terms:
   a. Limiting friction
   b. Coefficient of friction
6. Compute the coefficient of friction of a rough surface whose angle of friction is $20^0$.
7. Describe the conditions of equilibrium used by method of joints in the analysis of trusses.
8. Compute the friction experienced by a 300N body resting on a rough surface with an angle of friction of $20^0$ when pushed by a horizontal force of 75N.
9. State the equations of equilibrium in space.
10. Compute the area moment of inertia for a triangular section of base 'b' and height 'h' about its base.

***Part-B (Marks: 5×10=50)***

11. A ladder of the length 5m has a weight of 200N. The foot of the ladder rests on the floor and the top of it leans against a vertical wall. Both the wall and floor are smooth. The ladder is inclined at $60^o$ with the floor. A weight of 300N is suspended at the top of the ladder. Compute the value of the horizontal force to be applied at the foot of the ladder to keep it in equilibrium.
12. A post is held vertical by three cables AB,AC and AD as shown in Figure 1. If tension in cable AB is 40 N , calculate the required tension in AC and AD so that the resultant of the three forces applied at A is vertical (using vector approach).

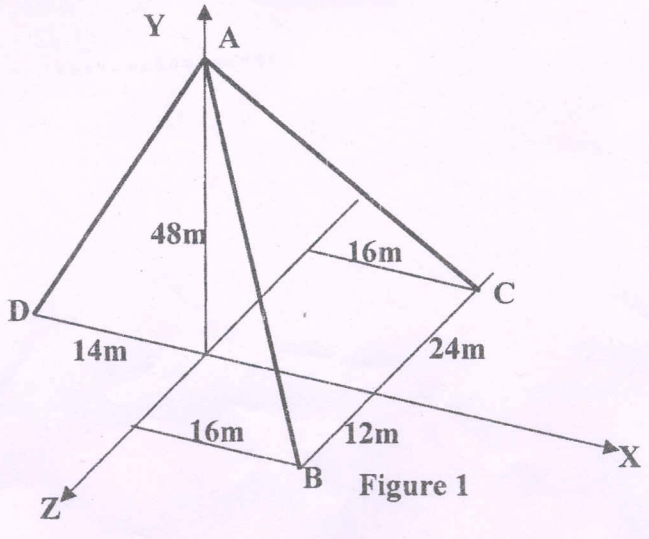


Figure 1

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13. Compute the moment of inertia of the shaded area shown in Figure 2 about its centroidal axes. All dimensions are in metres.

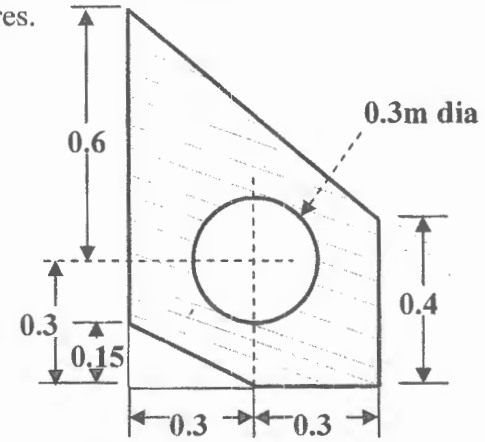


**Figure 2**

14. Evaluate the force in each member of truss shown in Figure 3.

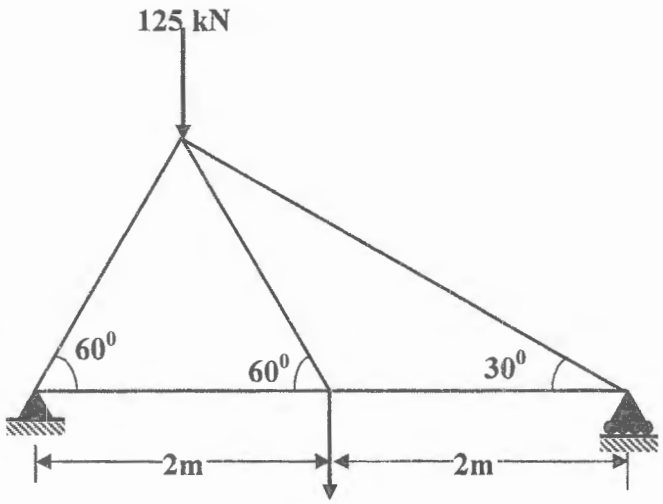


**Figure 3**

15. Block weighing 60 N rests on a block B weighing 80 N as shown in Figure 4. Block A is restrained from moving by a horizontal rope tied to the wall. What force P, parallel to the plane, inclined at 30 degrees with the horizontal is necessary to start B down the plane? Assume coefficient of static friction for all surfaces as 0.3.

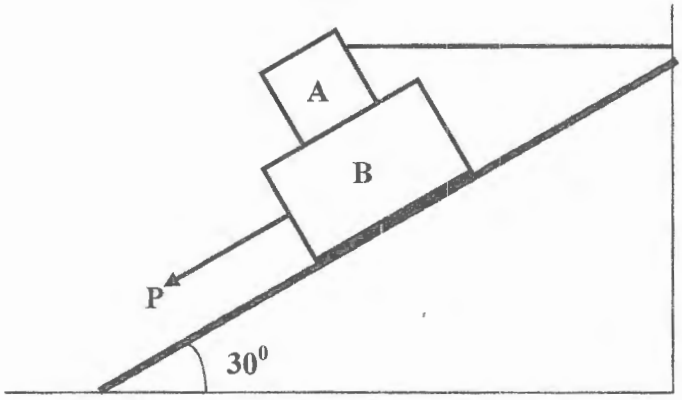


**Figure 4**

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16. a) The three forces shown in Figure 5(a) produce a resultant force **R** acting through point **A**. Find the magnitude and sense of **P** and **F**.
b) In the Figure 5(b), the moment of a certain force F is 750 Nm clockwise about O and 2100 Nm clockwise about B. Compute the force F if its moment about A is zero.

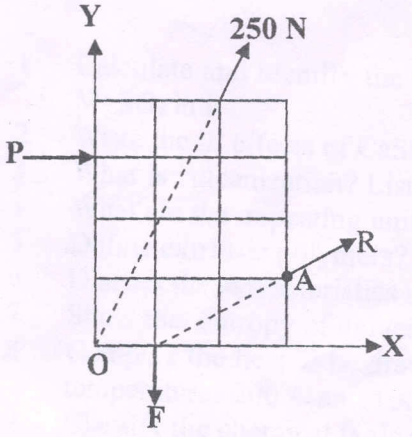

Figure 5(a)

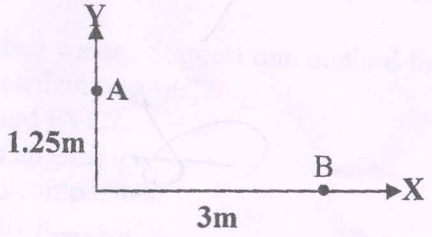

Figure 5(b)

17. Determine the Moment of Inertia of area under a curve, given in Figure 6, of Equation $x = ky^2$ about X and Y axes.

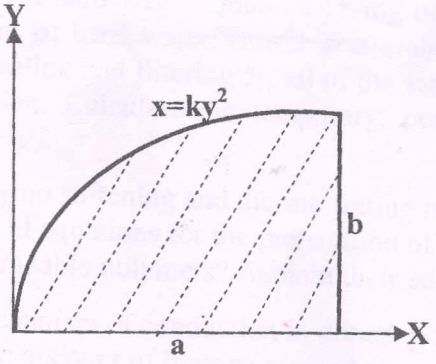

Figure 6

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