

**MODEL PAPER**

Subject Code: R161111/R16

Set No - 1

**I B. Tech I Semester Regular Examinations Nov. - 2016**

**ENGINEERING MECHANICS**

(Common to AE,AME,BioTech,ChemE,CE,EEE,ME,MetalE,MinE,PCE,PE)

**Time: 3 hours**

**Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**  
Answering the question in **Part-A** is **Compulsory**,  
**Four** Questions should be answered from **Part-B**

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**PART-A**

1. (a) Explain superposition law and law of transmissibility
- (b) Define equilibrium of a body and give conditions of equilibrium when subjected to forces.
- (c) Define Truss and free body diagram.
- (d) Differentiate centroid and center of gravity.
- (e) State Transfer theorems.
- (f) Define motion. Write different types of motion.
- (g) Write Impulse-Momentum equation

[7 x 2 = 14]

**PART-B**

2. (a) Explain various force systems with neat sketches.
- (b) A 108 N block is held on a  $40^\circ$  incline by a bar attached to a 150 N block on a horizontal plane shown in Figure.1. The bar which is fastened by smooth pins at each end is inclined  $20^\circ$  to the horizontal. The coefficient of friction between each block and its plane is 0.325. For what horizontal force P, applied to 150 N block will motion to the right be impending?

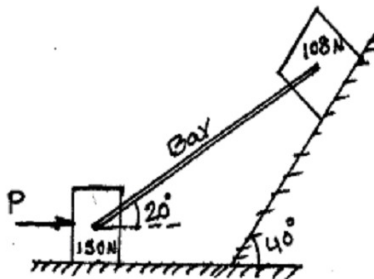


Figure.1

[6+8]

3. (a) A beam AB is located supported and loaded as shown in Figure.2. Find the reactions at the supports.

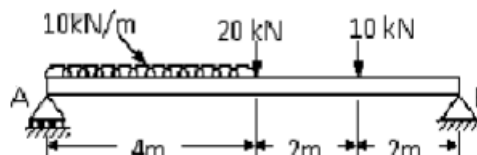


Figure.2

3. (b) Two identical rollers, each of weight 100 N, are supported by an inclined plane and a vertical wall as shown in below Figure.3. Assuming smooth surfaces, find the reactions induced at the points of support A, B and C.

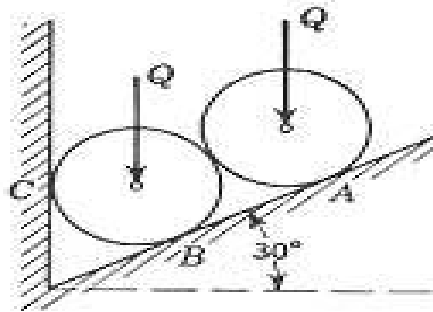


Figure.3

[7+7]

4. (a) Locate the centroid of a shaded area as shown in Figure.4.

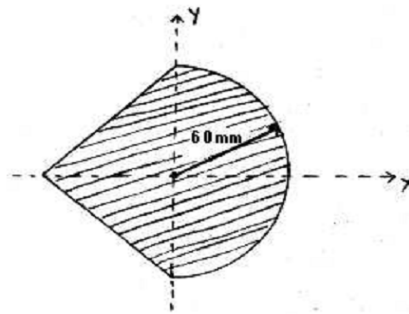


Figure.4

- (b) Uniform lamina shown Figure.5 consists of rectangle, a semi circle and a triangle. Find the center of gravity.

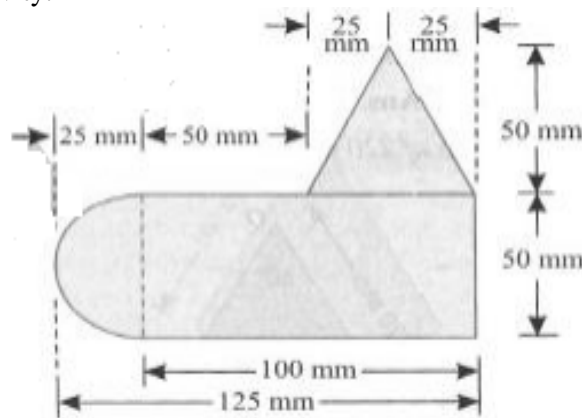


Figure.5

[7+7]

5. (a) Find out the mass moment of inertia of a right circular cone of base radius  $R$  and mass  $M$  about the axis of the cone.

5. (b) Find the moment of inertia of the area in the given Figure.6 about the axis 'AB'

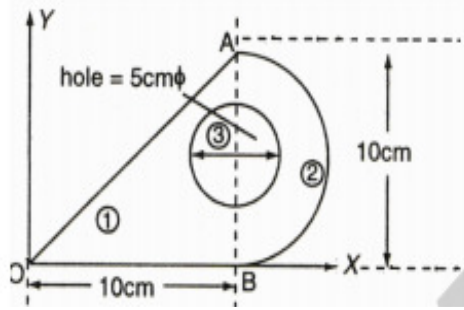


Figure.6

[6+8]

6. (a) A car has an initial speed of 25m/s and a constant deceleration of  $3\text{m/s}^2$ . Determine the velocity of the car when  $t=4\text{s}$ . What is the displacement of the car during the 4s time interval? How much time is needed to stop the car?

(b) A projectile is fired with an initial velocity of 250m/s at a target located at a horizontal distance of 4km and vertical distance of 700 m above the gun .Determine the value of firing angle to hit the target .Neglect air resistance.

[7+7]

7. (a) Two blocks of masses  $M_1$  and  $M_2$  are connected by a string as shown in Figure.7 below Assuming the coefficient of friction between block  $M_1$  and the horizontal surface to be  $\mu$  if the system is released from rest, find the velocity of the block A after it has moved a distance of 1 m Assume  $M_1=100\text{kg}$ .and  $M_2=150\text{kg}$  and  $\mu =0.20$ .

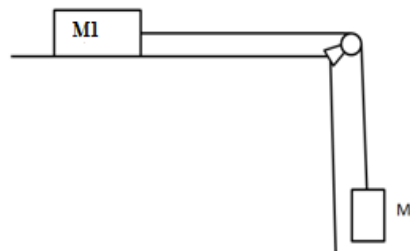


Figure.7

(b) Derive Work-energy equation.

[10+4]

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