

Subject Code: R13110/R13

Set No - 1

I B. Tech I Semester Supplementary Examinations May/June - 2016

**ENGINEERING MECHANICS**

(Common to CE, ME, CSE, PCE, IT, ChemE, AeroE, AME, MinE, PE, MetalE, Textile Engg.)

Time: 3 hours

Max. Marks: 70

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

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**PART-A**

- (a) What is meant by angle of repose? Explain.  
(b) Enunciate any two principles of equilibrium.  
(c) Differentiate center of gravity & centroid.  
(d) Derive the equation for moment of inertia of a rectangular section about centroidal axis.  
(e) Explain the kinetics of a rigid body when it is in plane motion.  
(f) Explain the concept of work-energy for a rigid body.

[3+3+4+4+4+4]

**PART-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 Figure 1 as shown below. The bar which is fastened by smooth pins at each end is inclined  $20^\circ$  to the horizontal. The co-efficient 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?

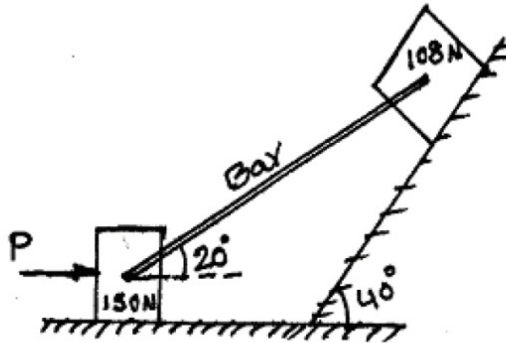
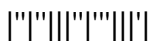
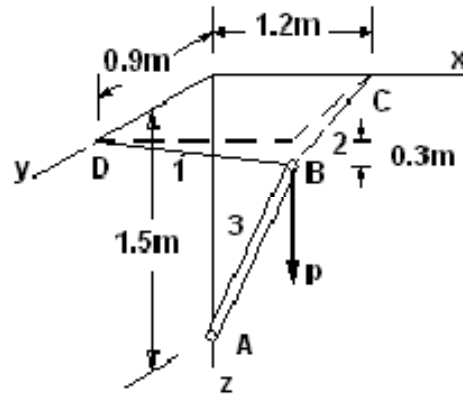


Figure 1

[16]



3. A mast AB supported by a spherical socket at A and guy wires BC and BD carries a vertical load P at B as shown below. Point B is 0.3 m vertically below the xy plane. Find the axial force induced in each of the three members of this system.



4. (a) Find the centroid of quadrant of an ellipse, whose equation is  $x^2/a^2 + y^2/b^2 = 1$  from basic principles. [16]  
 (b) Find the centroid of the plane uniform lamina shown in Figure 2, w.r.t. the axes shown.

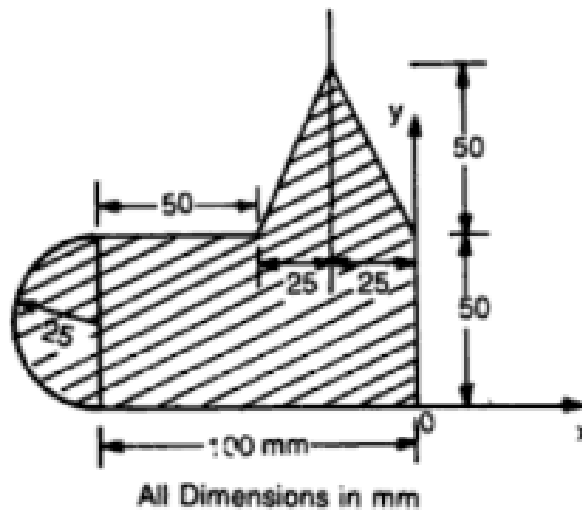
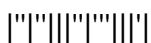


Figure 2

[8+8]



5. (a) Calculate the moment of inertia of shaded region shown below Figure 3 about the horizontal axis AA.

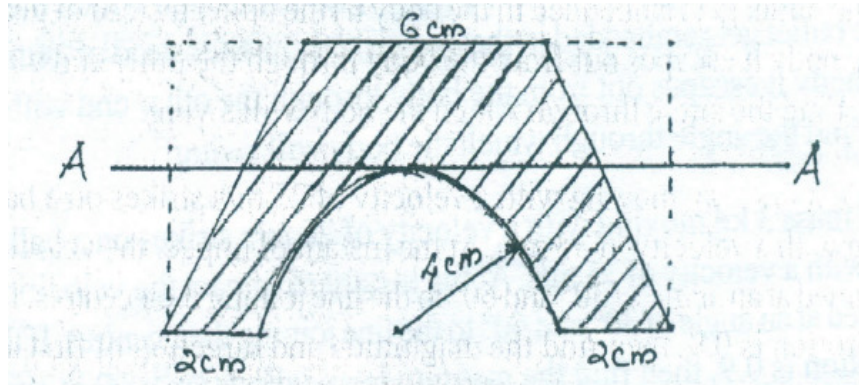


Figure 3

- (b) State and prove parallel axis and perpendicular axis theorems. [9+7]
6. (a) A projectile is fired at a speed of 800 m/s at an angle of elevation of  $50^\circ$  from the horizontal. Neglecting the resistance of air, calculate the distance of the point along the inclined surface at which the projectile will strike the inclined surface which makes an angle of  $15^\circ$  with the horizontal. [8+8]
- (b) Explain various types of motions of a rigid body. [8+8]
7. (a) An automobile moving with a uniform velocity of 40 Km/h is accelerated by increasing the traction force by 20%. If the resistance to motion is constant, find the distance traveled before it acquires 50 Km/h. Use work-energy method. [8+8]
- (b) What is the energy of motion for a rigid body rotating about a fixed axis? [8+8]

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