Code No: R13210 **R13** **SET-1**

I B. Tech II Semester Supplementary Examinations, April/May - 2019
ENGINEERING MECHANICS
(Com. to ECE, EEE, EIE, Bio-Tech, E Com E, Agri E)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is Compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1. a) Explain the reason for the development of frictional force between the two surfaces in contact. (4M)

   b) State the conditions of equilibrium for concurrent forces in space. (4M)

   c) Can Centroid of a volume coincide with the Centroid of its cross-section? Explain. (4M)

   d) Define radius of gyration for mass moment of inertia. (3M)

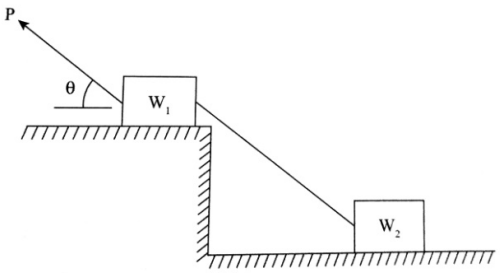
   e) Write the kinematic relations for two rotating rigid bodies in contact. (4M)

   f) State the Work- Energy principle. (3M)

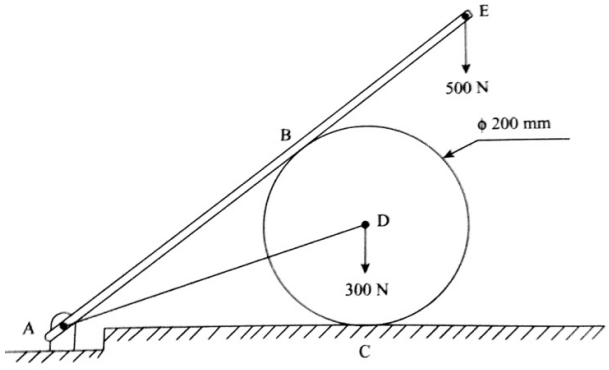
PART -B

2. a) Two unequal forces acting at a point at an angle of 150^0 have a resultant, which is perpendicular to the smaller force. The larger force is 24N. Find the smaller force and the resultant. (7M)

   b) Two blocks having weights W_1 and W_2 are connected by a string and rest on horizontal planes as shown in figure. If the angle of friction for each block is α, find the magnitude and the direction of the least force P applied to the upper block that will induce sliding. (9M)



3. a) A cylinder of weight 300N is held in equilibrium as shown in figure. Determine the tension in the string AD and reactions at B and C. Given that AE=750mm and AC=500mm. Assume that the surfaces are smooth. Bar AE is massless. (8M)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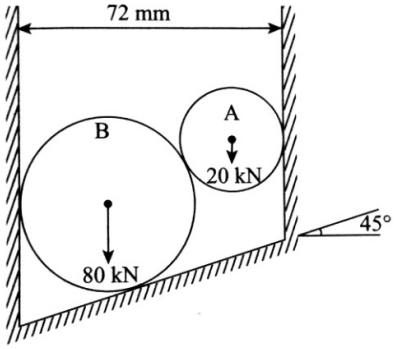
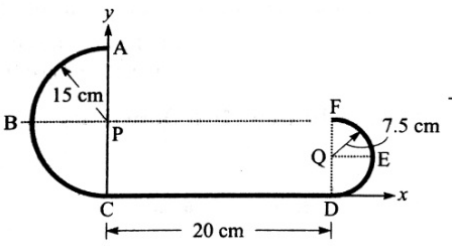
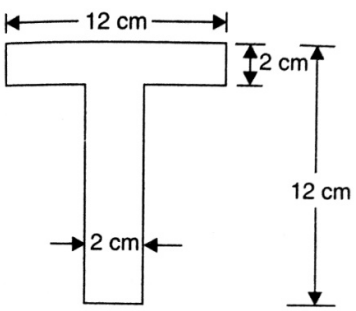
b) Two cylinders A and B of diameters 3cm and 6cm, weighing 20kN and 80kN respectively, are placed as shown in figure. Assuming all the contact surfaces to be smooth, find the reactions at the walls. (8M)



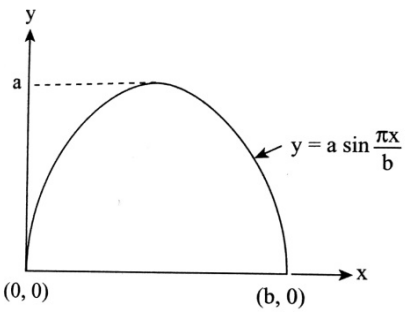
4. a) A wire has been bent into the shape as shown in figure. Determine the position of the centroid of the wire. (8M)



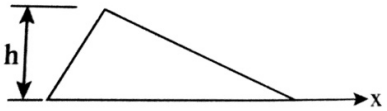
b) Find the centre of gravity of the T-section shown in figure. (8M)



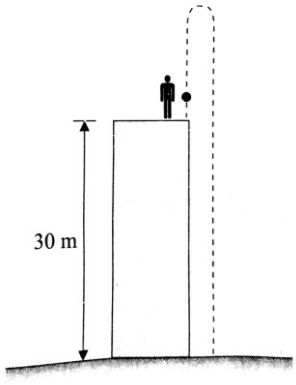
5. a) Determine the moment of inertia of the area under the sine curve with equation $y = asin\frac{\pi x}{b}$, about the x-axis. (8M)



b) Determine the mass moment of inertia of a thin triangular plate of altitude h and mass m about its base. (8M)



6. a) A ball is thrown vertically upwards with an initial velocity of 20m/s from the top of a building of 30m height. Determine i) the maximum height reached by the ball, ii) the time taken to reach the maximum height, iii) the velocity of the ball as it crosses the top of the building during its downward journey, iv) the time taken to hit the ground and the corresponding velocity. (8M)



b) Two cars, A and B, start from rest at the same instant, with the car A initially trailing at some distance behind the car B. The uniform accelerations of the cars A and B respectively $3m/s^2$ and $2m/s^2$. If the car A overtake the car B, when B has moved 200m, i) determine the time taken to overtake, ii) how far was the car A behind B initially, iii) determine the speed of each car at that instant. (8M)

7. a) Derive work energy method. (10M)

b) Write a brief note on Fixed axis rotation system. (6M)