Code No: R161111 **R16** SET - 1

I B. Tech I Semester Supplementary Examinations, April/May - 2017
ENGINEERING MECHANICS
(Com. to CE, EEE, ME, CHEM, BOT, AE, AME, MTE, MM, PE, PCE)

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 **FOUR** Questions from **Part-B**

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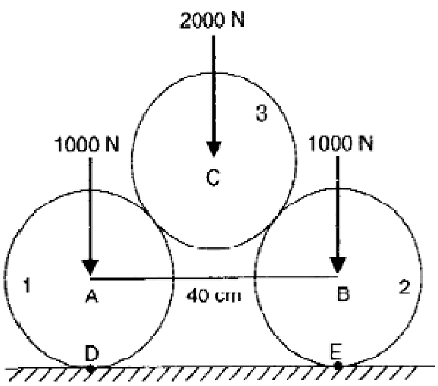
PART –A

1. a) State and prove principle of transmissibility of forces. (2M)
   b) Define a Free Body Diagram. Give two examples. (2M)
   c) Define centriod and centre of gravity, with examples. (2M)
   d) Find the product of inertia of a rectangle of sides **a** and **b** with respect to the axes that lie along its two sides. (2M)
   e) A particle of mass m moves rectilinearly under the action of a force $F = F_0 \, sin\, \omega t$ Determine the displacement-time equation, assuming initial displacement and velocity are zeros. (3M)
   f) The maximum range of a projectile is 2000 m. What should be the angle of elevation so as to obtain a range of 1400 m if the initial velocity remains unchanged? (3M)

PART –B

2. a) Two smooth circular cylinders, each of weight W= 1000N and radius 15cm, connected at their centres by a string AB of length 40 cm and rest upon a horizontal plane supporting above them a third cylinder of weight 2000N and radius 15cm as shown in fig. below. Find the force in string AB and the pressure produced on the floor at the points of contact D and E. (8M)



   b) A body weighing 20N is projected up a 20^0 inclined plane with a velocity of 12 m/s, coefficient of friction is 0.15. Find the maximum distance S that the body will move up the inclined plane. (6M)
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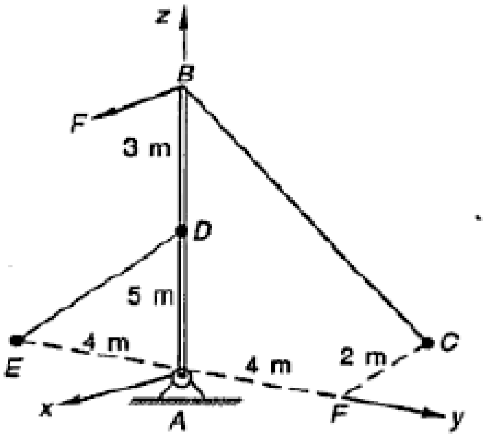
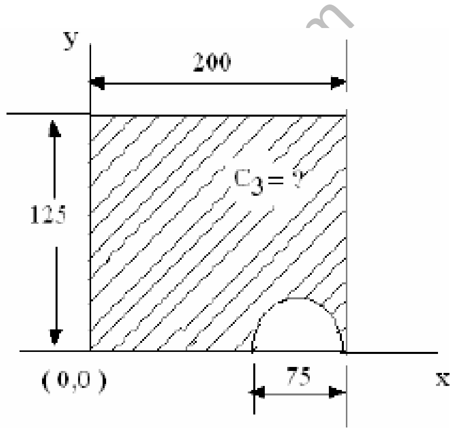
3. A vertical mast AB is supported in a ball and socket joint at A and by cables BC and DE as shown below. A force F = 500 i + 400 j – 300 k is applied at B. Calculate the reaction provided by the ground at A. (14M)



4. a) Locate the centroid for the shaded area as shown in below Figure. All dimensions are in mm. (7M)



b) Find the centroid of a quarter circular line from basic principles. (7M)

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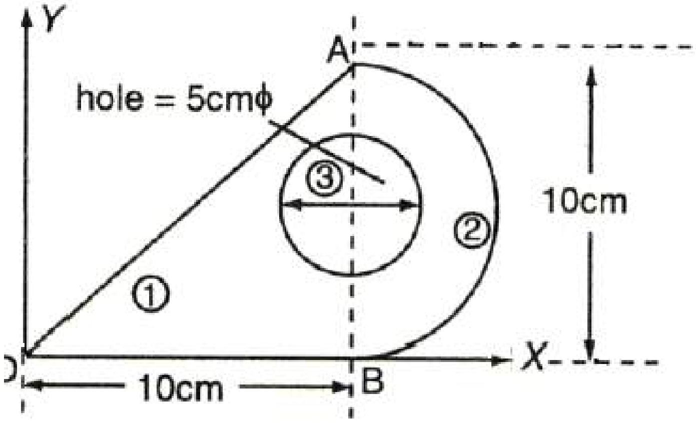
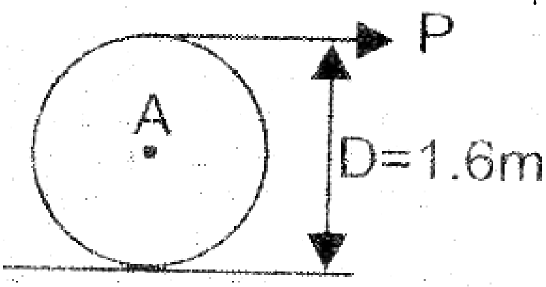
5. a) Determine the moment of inertia for the area given below about axis AB. (7M)

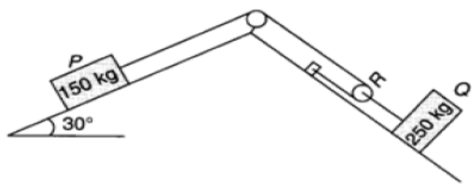


b) From basic principles find the moment of inertia of a solid disc. (7M)

6. A solid cylinder weighing 1200 N is acted upon by a force P horizontally as shown in figure below. Determine the maximum value of P for which there will be rolling without slipping. If P= 1000 N, determine the acceleration of the mass centre and the angular acceleration, given that the coefficient of static friction $\mu_s = 0.2$. And the co-efficient of kinetic friction $\mu_k = 0.15$. (14M)



7. a) Find the tension in the string as shown in the figure below. (8M)



b) Derive work energy equation of translation. (6M)