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

I B. Tech II Semester Supplementary Examinations, Nov/Dec - 2018
ENGINEERING MECHANICS
(Com. to ECE, EEE, EIE, Bio-Tech, E Com E, Agri E)

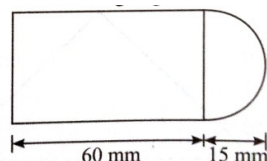Time: 3 hours   Max. Marks: 70

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 about   (4M)
        (i) Coefficient of friction; (ii) Cone of friction.

    b) Discuss the law of converse of the triangle of forces.   (4M)

    c) Distinguish between centroid and center of gravity.   (4M)

    d) Discuss the significance of polar moment of inertia and radius of gyration.   (4M)

    e) Explain the differences between kinematics and kinetics.   (3M)

    f) State and explain D'Alemberts principle.   (3M)

PART -B

2. a) What do you understand by the term'Couple'? Discuss the characteristics of a (7M)
        couple.

    b) A uniform ladder of weight 800N and of length 7 m rests on a horizontal ground (9M)
        and leans against a smooth vertical wall. The angle made by the ladder with the
        horizontal is 60^0. When a man of weight 600N stands on the ladder at a distance
        4m from the top of the ladder, the ladder is at the point of sliding. Determine the
        coefficient of friction between the ladder and the floor.

3. a) State and Prove Lami's theorem.   (8M)

    b) Three forces of magnitudes 40 kN, 15 kN and 20 kN are acting at a point O. The (8M)
        angles made by 40 kN, 15 kN and 20 kN forces with x-axis are 60^0, 120^0 and 240^0
        respectively. Determine the magnitude and direction of the resultant force.

4. a) Determine the centroid of the semi-circle whose radius is R.   (8M)

    b) Determine the centre of gravity of a hemisphere of radius `r`.   (8M)

5. a) Describe the method of finding Moment of Inertia of composite areas.   (8M)

    b) Determine the moment of inertia of the   (8M)
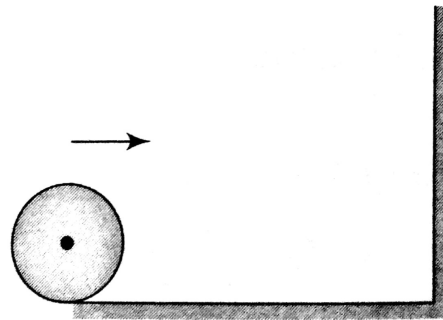   following figure about centroidal axis.

60 mm   15 mm

6. a) A fly wheel has its angular speed increased from 20 rad/s to 75 rad/s in 100 (7M)
        seconds. If the diameter of the wheel is 2 m, determine the normal and tangential
        components of the displacement of the point during this time period.

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b) Two trains R and S start from rest simultaneously from stations A and B facing each other with accelerations 0.5 m/s^2 and 2/3 m/s^2 reaching their maximum speeds of 90 kmph and 72 kmph respectively. If they cross each other midway between the stations, find the distance between the stations and the time taken by each other. (9M)

7. a) A ring weighing 350gm and a solid cylinder weighing 450gm, both having radius 110mm are given the same velocity to roll towards the wall, as shown in figure. If they start at the same time, which one will hit the wall earlier? (9M)

b) Determine the work done by an electric motor in winding up a uniform cable which hangs from a hoisting drum if its free length is 20m and weighs 800N. The drum is rotated by the motor. (7M)