

Code: CE2T4

**I B.Tech - II Semester – Regular/Supplementary Examinations
April – 2018**

**ENGINEERING MECHANICS
(CIVIL ENGINEERING)**

Duration: 3 hours

Max. Marks: 70

PART – A

Answer *all* the questions. All questions carry equal marks

11x 2 = 22 M

1.

- a) Explain free body diagram with example.
- b) State the laws of dry friction.
- c) Explain coefficient of friction and Angle of friction.
- d) Find the centroid of a Rectangle from basic principles.
- e) Find the moment of inertia of a right angled triangle from basic principles.
- f) Determine the mass moment of inertia of a circular ring or hoop of mass 'm' and radius 'r' about centroidal axes.
- g) Find the reactions for a simply supported beam of length 10m subjected to a point load 10N at mid point by applying the virtual work principle.
- h) An airplane while taking off moves with a constant acceleration over a runway of 400m in 8 seconds. Determine the velocity with which it takes off.
- i) State D'Alembert's principle.

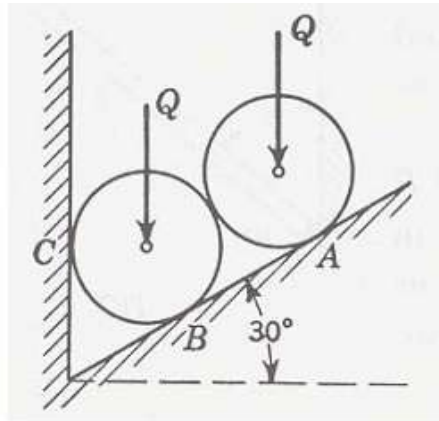
- j) Define time of flight and range when a particle is projected on an inclined plane.
- k) Define work done by a force acting on rigid body.

PART – B

Answer any **THREE** questions. All questions carry equal marks.

$$3 \times 16 = 48 \text{ M}$$

2. a) Two identical rollers, each of weight 100N , are supported by an inclined plane and a vertical wall as shown in figure below. Assuming smooth surfaces, find the reactions induced at the points of support A, B and C. 12 M

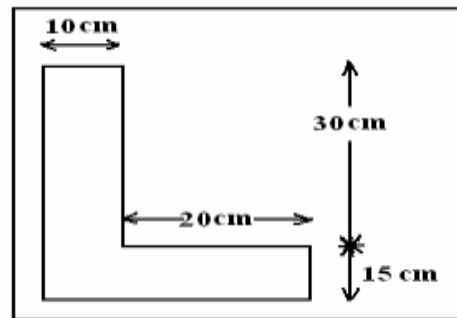


- b) Briefly discuss about wedge friction and its applications.

4 M

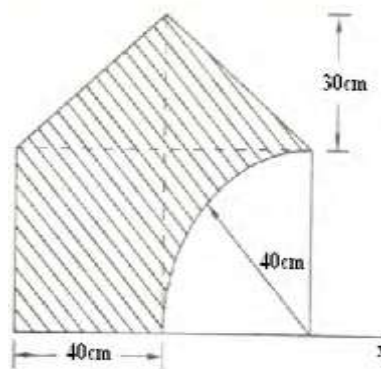
3. a) Find the centroid of the plane lamina shown in Figure.

8 M



b) Find the moment of inertia of the lamina about x-axis shown in figure.

8 M



4. a) Derive the expression for the moment of inertia of a homogeneous right circular cone of mass 'm', base radius 'r' and altitude 'h' with respect to geometrical axis. 12 M

b) Explain the principle of virtual work and virtual displacement.

4 M

5. a) A burglar's car had a start with an acceleration of 2 m/s^2 . A police vigilant came in a van to the spot at a velocity of 20 m/s after 3.75 seconds and continued to chase the burglar's

car with uniform velocity. Find the time in which the police van will overtake the burglar's car. 8 M

b) A 50 kg block kept on the top of a 15° sloping surface is pushed down the plane with an initial velocity of 20m/s. If coefficient of kinetic friction is 0.4, determine the distance travelled by the block and the time it will take as it comes to rest. 8 M

6. a) Discuss about projectile motion. Derive the general equation of projectile motion and for max height of projectile motion. 8 M

b) A flywheel rotating at 300 rpm reduces its speed to 240 rpm while making 10 complete revolutions. Determine its angular retardation assuming it to be uniform. What is its speed after 3 seconds assuming the same retardation ? Also determine how much time is taken to come to a stop from a speed of 300 rpm? 8 M