PVP 14

Code: CE2T4

I B.Tech - II Semester – Regular/Supplementary Examinations
April – 2019

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) Evaluate the magnitude and direction of the resultant force for two like parallel forces of 50N and 100N act at the ends of a rod 300mm long.
b) Two forces of magnitude 15N and 12N are acting at a point. The angle between the forces is 60^0. Evaluate the resultant in magnitude and direction.
c) Differentiate between angle of friction and cone of friction.
d) Evaluate the centroid of a uniform plate in the form of a symmetrical trapezium whose parallel sides are 3m and 1.5m(top side) in length and 2m apart.
e) State the parallel axis theorem of moment of inertia
f) Formulate the expression for the mass moment of inertia of a bar about an axis through one end and perpendicular to the bar whose length is L.
g) State the principle of virtual work.
h) The motion of a particle is defined by the relation $x=t^3-12t^2+36t+30$, where x is expressed in meters and t in seconds. Determine the time and position when the particle's velocity is zero.

i) Determine the angle of projection for particle which is projected 5m high with a velocity of 60m/s.

j) A fly wheel 1m diameter accelerates uniformly from rest to 1000rpm in 20sec .What is its angular acceleration?

k) State the D'Alembert's principle.

PART – B

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

3 x 16 = 48 M

2. a) A rigid prismatic weightless bar AB is supported in a vertical plane by a hinge at the end A and by a horizontal string attached to the bar at D as shown in figure-1. The end B of the bar carries a load W. Evaluate the tension in the string and the direction of the reaction at the hinge in terms of W and θ. 8 M

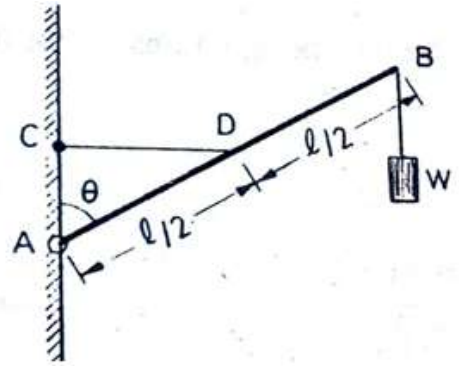

Figure-1

b) A uniform bar AB,10m long and weighing 280N ,is hinged at B and rests upon a 400N block at A as shown in figure-2. If the coefficient of friction is 0.40 at all contact surfaces, Evaluate the horizontal force P required to start moving the 400N block. 8 M

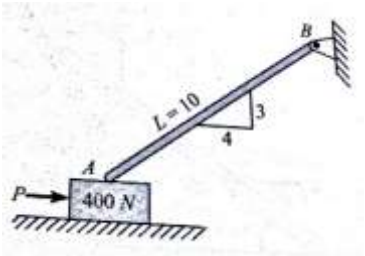

Figure-2

3. a) Determine by direct integration the coordinates of the centroid of the shaded area formed by the quarter of an ellipse as shown in figure-3. 8 M

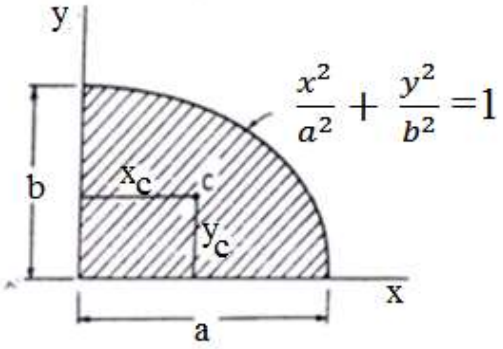

Figure-3

b) A girder of I-shape cross section has equal flanges each 12cmx2cm connected by a web 20cmx2cm. Determine the moment of inertia about its centroidal axes. 8 M

4. a) Determine the mass moment of inertia of a circular plate of uniform thickness, about centroidal axis. 8 M

b) Using method of virtual work, determine the reaction at A of the beam shown in figure-4. 8 M

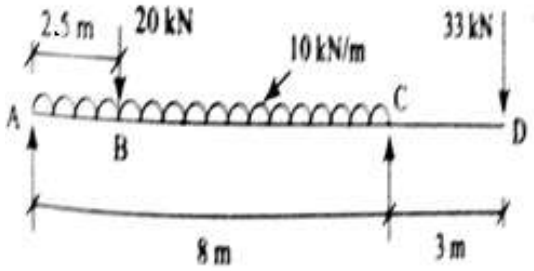

Figure-4

5. a) A stone is dropped from the top of a tower 60m high. At the same time another stone is thrown up from the foot of the tower to meet the first stone at a height of 18m. Determine i) the time when the two stones meet, ii) the velocity with which the second stone was thrown up. 8 M

b) The pulley shown in figure-5 weighs 600N and has a radius of 0.80m. A rope passing over this pulley supports 800N load at one end and 400N at another end. Determine the tension in the string and the angular acceleration of the pulley, if the blocks are allowed to move. 8 M

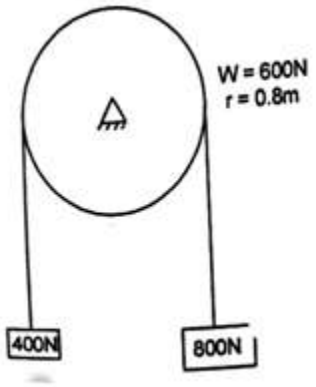

Figure-5

6. a) A body is projected upwards with a velocity of 30m/s at an angle of 30^0 with the horizontal. Determine i) The time of flight ii) The range of the body iii) The maximum height attained by the body. 8 M

b) A circular cylinder of mass m and radius r is suspended from a cord that is wound around its circumference . If the cylinder is allowed to fall freely, prove that the tension in the cord is equal to that of 1/3 of weight of the drum. Also evaluate the acceleration in terms of acceleration due to gravity. 8 M