Code: 15A01201 **R15**

B.Tech I Year II Semester (R15) Regular & Supplementary Examinations May 2018

ENGINEERING MECHANICS

(Civil Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

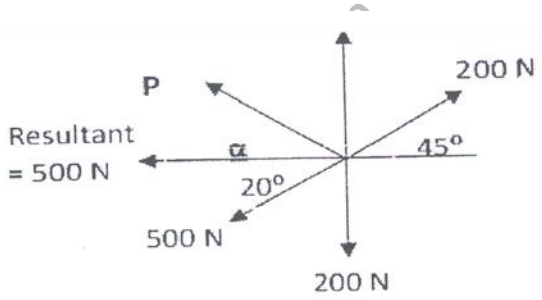
(a) Explain the various systems of forces with suitable examples.
(b) What is equilibrium?
(c) What is a self-locking screw jack?
(d) Define coefficient of static friction.
(e) State perpendicular axis theorem.
(f) Differentiate between area moment of inertia and mass moment of inertia.
(g) What is curvilinear motion give an example?
(h) What is fixed axis rotation?
(i) What is the difference between truss and frame?
(j) What is resonance?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 The four coplanar forces are acting at a point as shown in the figure below. One force is unknown (P). The resultant is 500 N and acting along X axis. Determine the unknown force (P) and its inclination (α) with X axis.

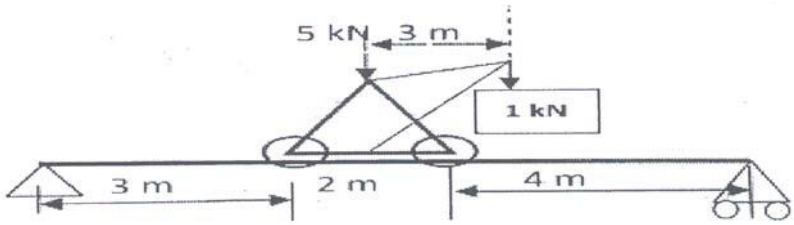


OR

3 The forces P, Q, R and S act on a particle at O in the plane of the coordinate axis OX and OY making an angles p, q, r, s respectively with OX in the anti-clockwise direction. Determine the resultant and the angle it makes with OX when P = 3 kN, Q = 3 kN, R = 5 kN, S = 5 kN and p = 10°, q = 70°, r = 100°, s = 300° respectively.

UNIT – II

4 A ladder 12 m length and 500 N weight is resting against a smooth wall. Find the coefficient of friction between floor and ladder if ladder starts slipping when the angle between ladder and floor is ≤ 50°.
Find the reactions at support for the following beam.



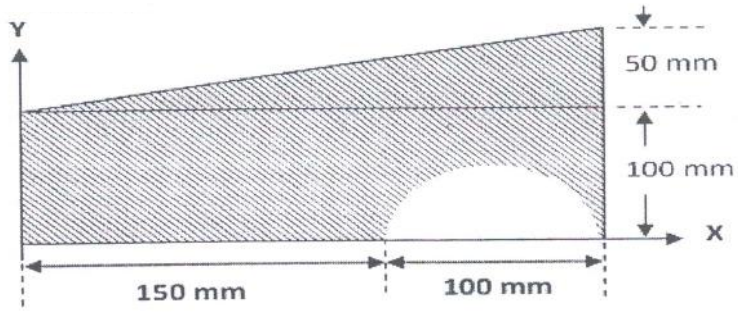
OR

5 A Screw Jack has square threads of mean of 10 cm and a pitch of 1.25 cm. Determine the force that must be applied to the end of 50 cm lever to raise a weight 50 kN. And the efficiency of the jack.

Contd. in page 2

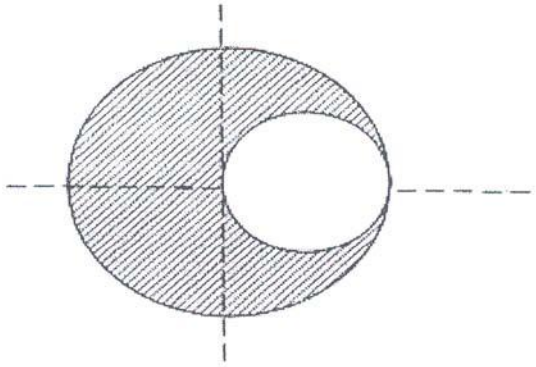
UNIT – III

6 Determine the centroid of the shaded area of above lamina.



OR

7 A circle is cut from a circle of diameter 450 mm as shown in the figure below. Calculate the polar moment of inertia of the remaining shape.



UNIT – IV

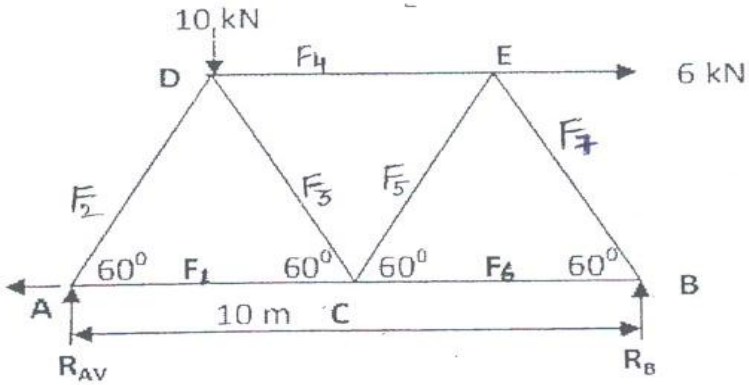
8 A particle is projected with a velocity of 10 m/sec at an angle of elevation of 60°. (i) Find the equation of the path of motion. (ii) Time required to cover the range. (ii) The length of range.

OR

9 A train starts from rest and moves along a curved track of radius 800 m with uniform acceleration until it attains a velocity of 72 km/h at the end of 3 minute. Determine the tangential, normal and total acceleration in m/s^2 of the train at the end of second minute.

UNIT – V

10 Find the forces in the members of the following truss. The truss is hinged supported at left end and roller supported at right end.



OR

11 A weight of 50 N suspended from a spring vibrating vertically with an amplitude of 7.5 cm and a frequency of 1 oscillation/sec. Find: (i) The stiffness of the spring. (ii) The maximum tension induced in the spring (iii) The maximum velocity of the weight.

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