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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Second Semester, B.E. – Civil Engineering

Semester End Examination; June - 2016

Engineering Mechanics

Time: 3 hrs *Max. Marks: 100*

***Note**: i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.*
ii) Missing data may suitably be assumed.

UNIT - I

1 a. State and prove Varignon's theorem of moments. 6

b. Determine the magnitude, direction and the point of application of the smallest force applied to the rectangular plate A, B, C, D as shown in Fig. Q(1b), which produces a clockwise moment of 50 N-m about the hinge E. 7

c. If the sack at A has a weight of 20 N. Determine the weight of the sack at B and the force in each cord needed to hold the system in equilibrium position as shown in Fig. Q(1C). 7

2 a. With sketches, explain different types of supports. 6

b. With sketches, explain the types of loading on beams. 6

c. Determine the reactions at the supports for the beam shown in Fig. Q2(c). 8

UNIT - II

3 a. Distinguish between centroid and centre of gravity. 4

b. Locate the centroid of a semicircle with respect to horizontal diameter by the method of Integration. 6

c. Locate the centroid of the lamina shown in Fig. Q3(c) with respect to point O. 10

4 a. Locate the centroid of quadrant of circular lamina from first principle. 6

b. Determine the centroid of lamina shown in Fig Q 4(b). 14

UNIT - III

5 a. State and prove parallel axis theorem. 6

b. Determine the moment of inertia of triangle of base width 'b' and height 'h' about the base. 6

c. Determine the moment of inertia and radius of gyration of the area shown in Fig. Q5(c) about the base AB and centroid axis parallel to AB. 8

6 a. In a tabular form, and with sketches, indicate the formulae used for Calculating I_{XX} and I_{YY} for various geometrical shapes to determine moment of Inertia. 6

b. Determine the minimum radius of gyration of the section among x - x and y - y centroidal axis of the composite section shown in Fig. Q6(b). 14

Contd…2

UNIT - IV

7 a. Define coefficient of the friction. Show that the coefficient of friction is tangent of the angle of friction. 4

b. Explain : i) Angle of friction ii) Angle of response iii) Cone of friction 6

c. A uniform bar AB 5 m long weighing 280 N is hinged at B, rest upon 400 N block at A as shown in Fig Q7(c). If coefficient of friction is 0.4 for all contact surfaces, find the horizontal force P required to move the 400 N block. 10

8 a. What is meant by angle of repose? Show that angle of repose in equal to angle to friction. 8

b. A small block of weight 1000N is paced on a 30º incline with co-efficient of friction = 0.25 as shown in Fig. Q 8(b) Find the horizontal force P required to the applied for : 12

i) Impending motion down the plane ii) Impending motion up the plane.

UNIT - V

9 a. What is a projectile? Define the following terms: 10

i) Angle of projection ii) Horizontal range iii) Vertical height and iv) Time of flight.

b. A cricket ball thrown from a height of 1.8 m above ground level at an angle of 30º with horizontal with velocity of 12 m/s and is caught by fielder at a height of 0.6 m above the ground. Determine the distance between the two players. 10

10a. State and explain D' Alembert's principle. 6

b. Explain different types of impacts of two bodies. 4

c. Derive the three equations of motion with internal notations. 10

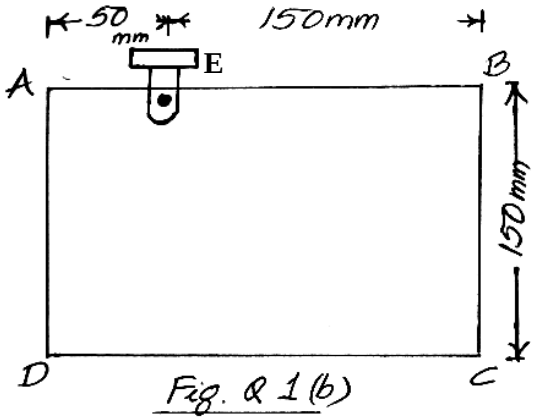

Fig. Q 1(b)

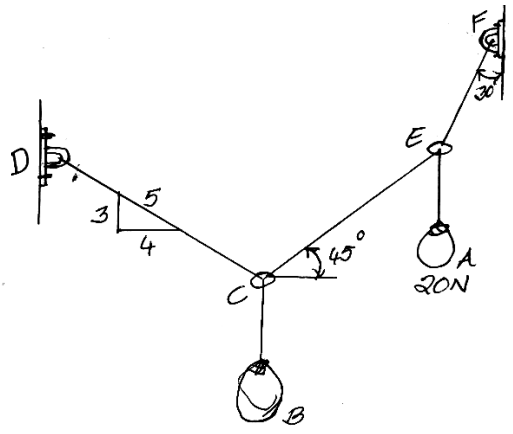

Fig. Q 1(c)

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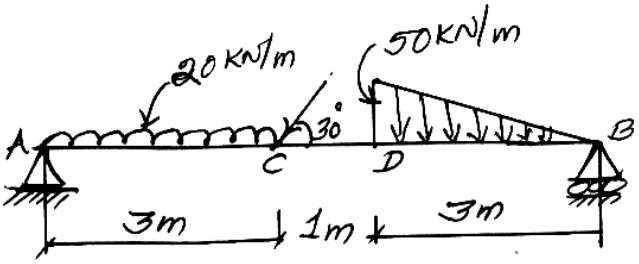

Fig. Q 2(c)

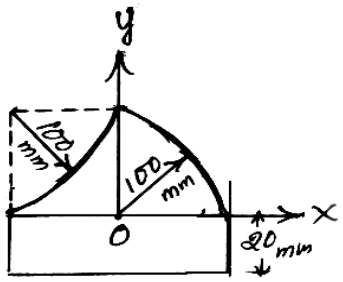

Fig. Q 3(c)

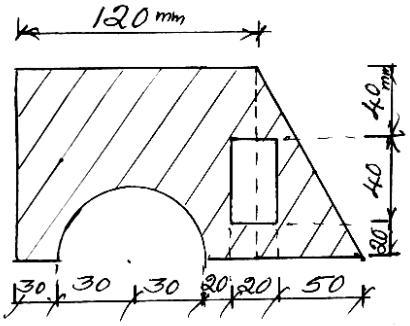

Fig. Q 4(b)

All dimensions in mm

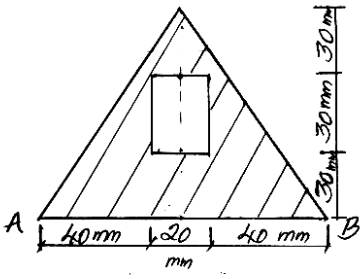

Fig. Q 5(c)

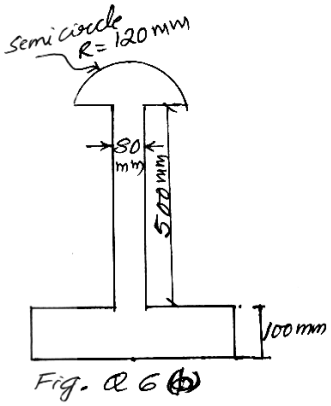

Fig. Q 6(b)

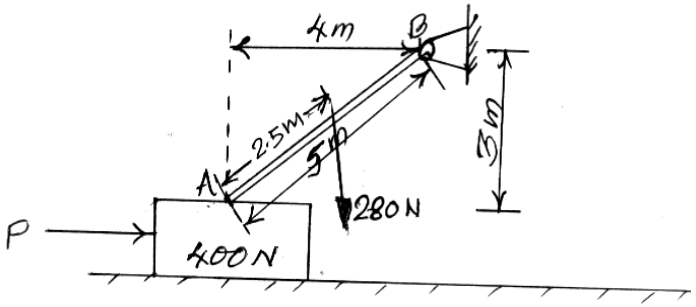

Fig. Q 7(c)

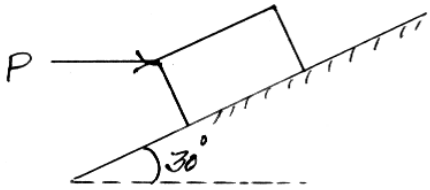

Fig. Q 8(b)

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