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

*(An Autonomous Institution affiliated to VTU, Belagavi)*

**I/II Semester, B.E. - Semester End Examination; May/June - 2018**

**Engineering Mechanics**

**(Common to All Branches)**

*Time: 3 hrs* *Max. Marks: 100*

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

## UNIT - I

1 a. State the Newton's three laws of motion. 6

b. State and explain principle of transmissibility. 4

c. Compute the tension in the strings AB, BC, and CD as shown in Fig. 1(c). 10

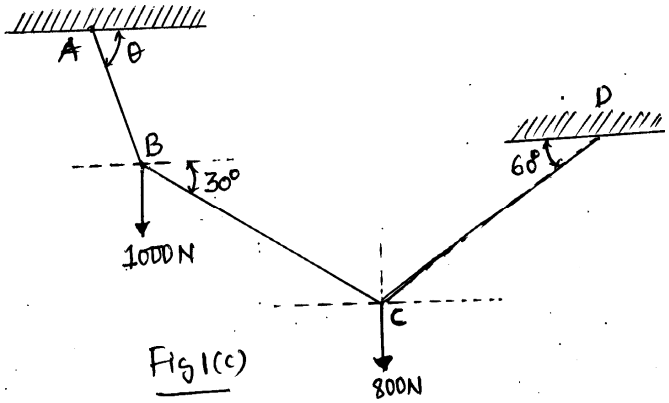

Fig 1(c)

2 a. Explain the different types of Supports and Reactions. 8

b. Determine the reactions at *A* and *B* for the loaded beam shown in Fig. 2(b). 12

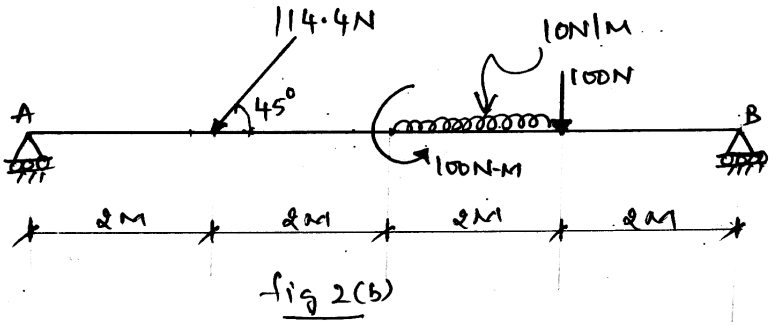

Fig 2(b)

## UNIT - II

3 a. State laws of static friction. 5

b. A block weighing 4000 N is resting on horizontal surface supports another block of 2000 N as shown in Fig. 3(b). Find the horizontal force *F* just to move the block to the left. Take the coefficient for all contact surfaces as 0.2. 15

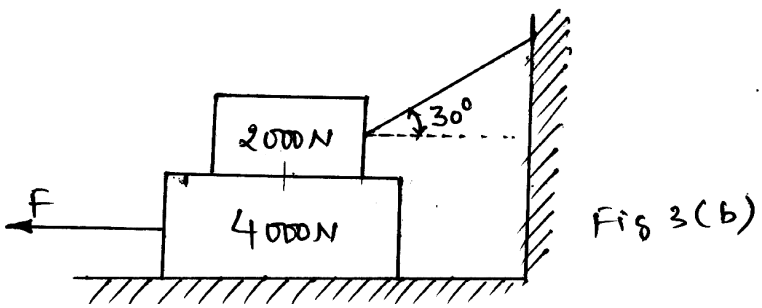

Fig 3(b)

Contd…2

4 a. Explain the terms: i) Limiting friction ii) Angle of repose iii) Cone of friction iv) Angle of friction — 8

b. A ladder 5 M long rests on horizontal floor and against a smooth vertical wall at angle of 70º with the floor. The weight of ladder is 900 N. The ladder is at the verge of slipping when a man weighing 750 N stands on it at a distance of 3.5 m measured along the ladder from top of ladder. Determine the coefficient of friction between the ladder and the floor. — 12

**UNIT - III**

5 a. Define: i) Centre of gravity ii) Centroid iii) Axis of symmetry iv) Axis of reference. — 8

b. Determine the Centroid of an area shown in Fig. 5(b) with respect to *OX* and *OY*. All dimensions are in mm. — 12

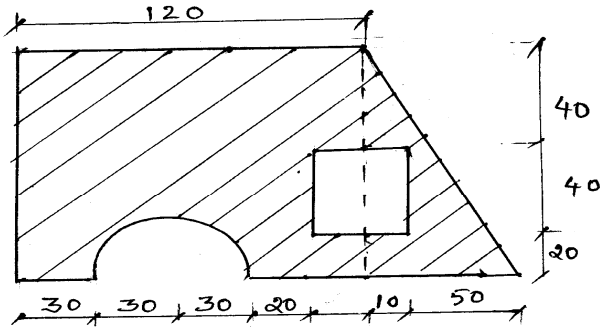


Fig 5(b)

6 a. Determine the centre of gravity of a rectangle by method of integration. — 8

b. Locate the Centroid of plane lamina as shown in Fig. 6(b). — 12

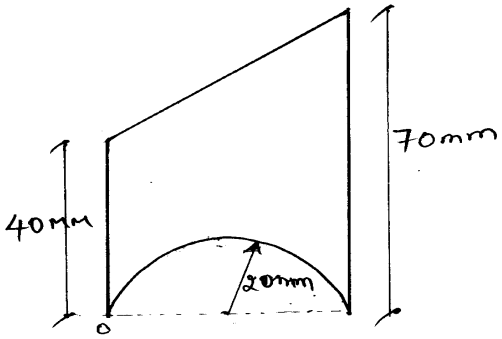


Fig 6(b)

**UNIT - IV**

7 a. State and prove parallel axis theorem. — 5

b. Derive the expression for moment of inertia of a triangle about the base using method of integration. — 5

c. Determine the radius of gyration and MI about its base AB for the area shown in Fig. 7(c) all dimensions are in mm. — 10

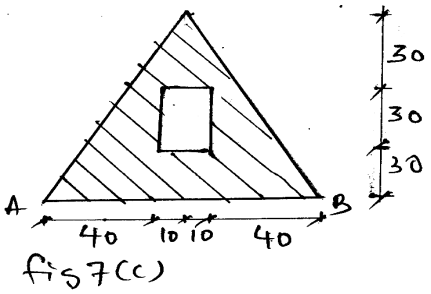


Fig 7(c)

Contd…3

8 a. Define the terms: i) Radius of gyration ii) Polar moment of Inertia. 4

b. From the first principle obtain an expression for the second moment of rectangle about its centroidal axis. 8

c. Find the moment of Inertia of section shown in Fig. 8(c) about its horizontal centroidal axis. 8

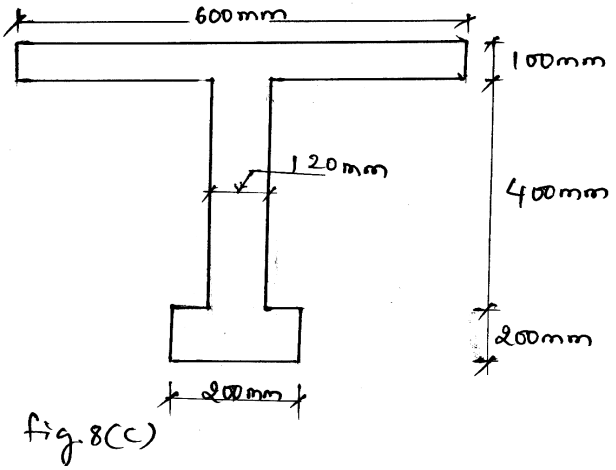


fig. 8(c)

**UNIT - V**

9 a. Define work, power and energy. 6

b. Explain D'Alembert's principle and its significance. 6

c. A parachute weighing 500 N falling with uniform acceleration from rest descends 5 m in the first four seconds. Find the resultant pressure of air on the parachute. 8

10 a. Define the following terms :

i) Projectile ii) Angle of projection iii) Horizontal range 10

iv) Vertical height v) 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 two players. 10

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