



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

(An Autonomous Institution affiliated to VTU, Belagavi)

Second 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

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|------|---|----|
| 1 a. | Define force. Mention and its characteristics with an example. | 4 |
| b. | Five guy wires tied at a point and are pulled in radial directions making equal angles with each other. If the magnitudes of pull on three consecutive wires are 50 kN, 70 kN and 60 kN, determine the magnitude of pulls on other two wires. | 8 |
| c. | Obtain the expression for magnitude and direction of the resultant of two coplanar concurrent forces, using parallelogram law of forces. | 8 |
| 2 a. | With a neat sketch, explain free body diagram and space diagram. | 5 |
| b. | Determine the magnitude, direction, position and intercepts of resultant force with respect to point A for the system of forces shown in Fig. Q 2(b). | 10 |
| c. | State and explain the principle of transmissibility. | 5 |

UNIT - II

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|------|--|----|
| 3 a. | With neat sketches, describe the different types of loads coming on beams and supports used in practice. | 10 |
| b. | A ladder 5 m long leans against a wall at an angle of 30° to vertical. The coefficient of friction between wall and floor is 0.3. Determine how high a man weighing 800 N can climb before the ladder slips. Weight of ladder is neglected. | 10 |
| 4 a. | Show that: i) Coefficient of friction = Tangent of angle of friction
ii) Angle of repose = Angle of friction. | 8 |
| b. | Explain the theory of solid dry friction. | 4 |
| c. | Find the support reactions for the beam loaded as shown in Fig. 4(c). | 8 |

UNIT - III

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|------|--|----|
| 5 a. | Distinguish between Centroid and Centre of gravity. | 4 |
| b. | From first principles, obtain the Centroidal distance of a quarter of a circle of radius 'R'. | 6 |
| c. | Find CG of the shaded area, with respect to given X and Y axis, Fig. Q5 (c). | 10 |
| 6 a. | With a neat sketch, explain axis of symmetry and its features. | 4 |
| b. | Derive an expression for the centroid of a semi circular lamina when its base is placed on the ordinate. | 6 |
| c. | For the shaded area shown in Fig. 6(c), find 'a' so that centroid is at 'O'. | 10 |

UNIT - IV

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|------|--|----|
| 7 a. | State and prove: i) Parallel axis theorem ii) Perpendicular axis theorem. | 10 |
| b. | Find the moment of inertia of hatched area shown in Fig. Q7(b) about the axis PQ. Also determine the radius of gyration. | 10 |

- 8 a. Determine the moment of inertia of a semi circle about centroidal axis parallel to diameter by method of integration. 10
- b. For the cross section shown in Fig. Q.8(b). Calculate the moment of inertia about the horizontal centroidal axis. Also determine the radius of gyration. 10

UNIT - V

- 9 a. With a neat sketch, explain for projectile motion : 6
 - i) Range ii) Time of flight iii) Maximum height iv) Angle of projection
- b. A stone is dropped into a well after 4 seconds the sound of splash is heard. If the velocity of sound is 330 m/s, find the depth of the well upto water surface. 10
- c. What is super elevation? Why it is necessary? 4
- 10 a. Derive all the three basic equations of motion in kinematics. 6
- b. Discuss on: i) Motion under gravity ii) Relative motion. 4
- c. A highway curve of 60 m radius has super elevation for a design speed of 45 kmph. Determine: i) Angle of super elevation 10
 - ii) If skidding occurs at a speed of 90 kmph, find the coefficient of friction.

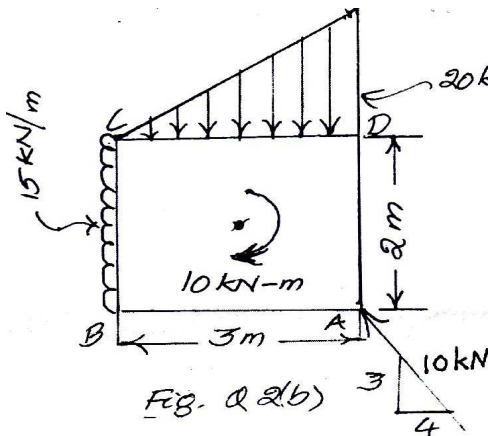


Fig. Q 2(b)

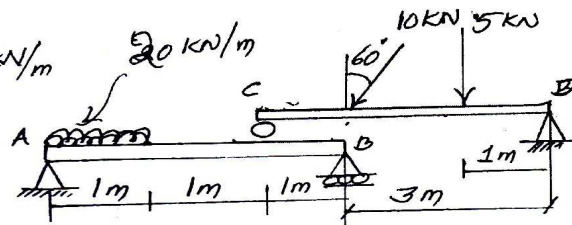


Fig. Q 4(c)

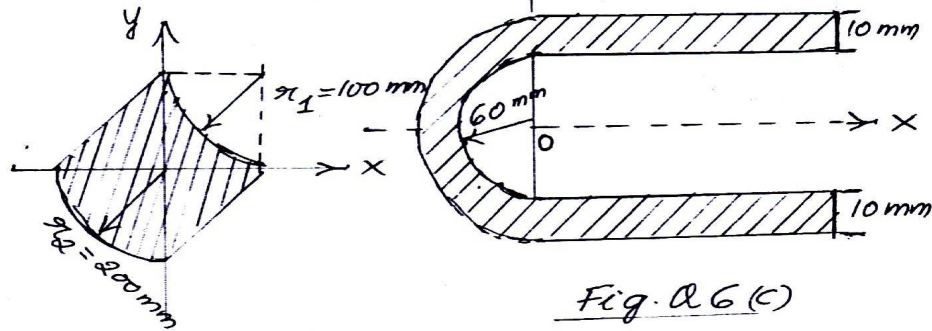


Fig. Q 6(c)

Fig. Q 5(c)

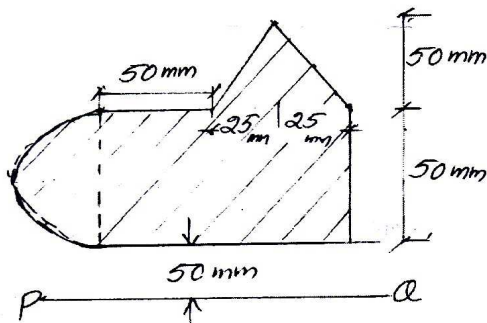


Fig. Q 7(b)

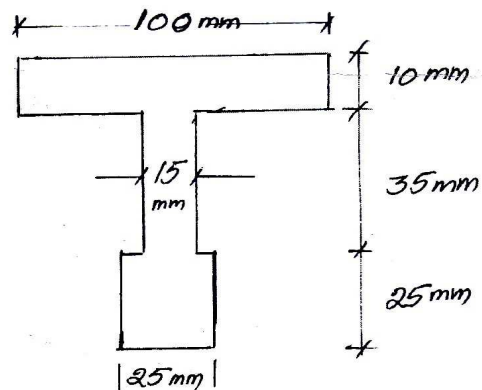


Fig. Q 8(b)