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

(An Autonomous Institution affiliated to VTU, Belgaum)

First Semester, B.E. : Make-up Examination; Jan/Feb -2016

Engineering Mechanics

(Common to all Branches)

Time: 3 hrs

Max. Marks: 100

- Note:** i) Answer **FIVE** full questions selecting **ONE** full question from each part.
ii) Missing data if any, may suitably assumed.

UNIT - I

- 1 a. Explain briefly:
- i) Force and its characteristics 8
 - ii) Method of Resolution for the Resultant force 8
 - iii) Lami's Theorem (Statement and proof). 8
- b. Determine the magnitude, direction and the point of application of the resultant force for the given system of forces shown in Fig. Q1(b). 6
- c. Compute the tensions in the strings AB, BC and CD shown in Fig. Q1(c). 6
- 2 a. With sketches, explain the types of loading on beams. 6
- b. Find the reaction at A and B for the beam shown in Fig. Q 2(b). 6
 - c. Determine the support reactions for the beam shown in Fig. Q 2(c). 8

UNIT - II

- 3 a. Find the centroid of a triangle from first principle. 6
- b. Determine the position of the centroid of the shaded area shown in fig Q 3(b) (From given axis). 6
 - c. For the plane over shown in Fig Q 3(c). Determine the C.G. with respect to X - X and Y - Y axis. 8
- 4 a. Define; i) Centroid ii) Axis of symmetry 6
- b. Determine the centroidal distance for a semi-circle from the diametral axis. 6
 - c. Find the C.G. of the shaded portion for the Fig. Q 4(c) with respect to X-X axis. 8

UNIT - III

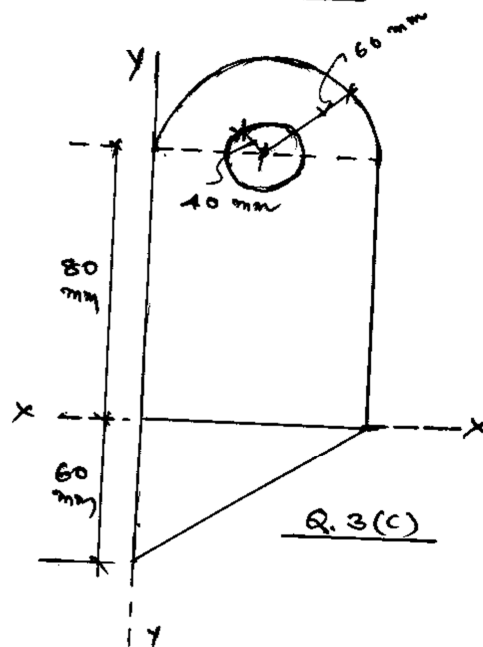
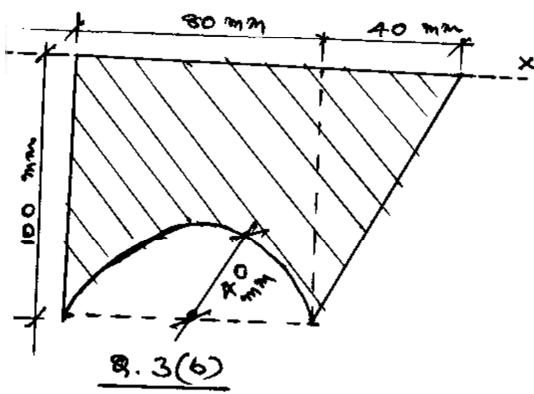
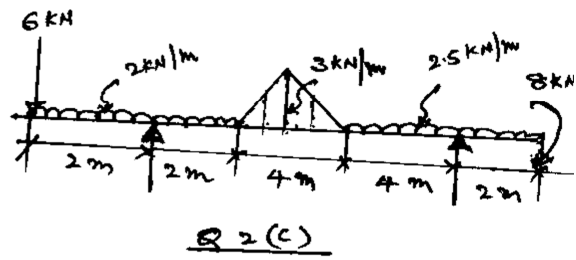
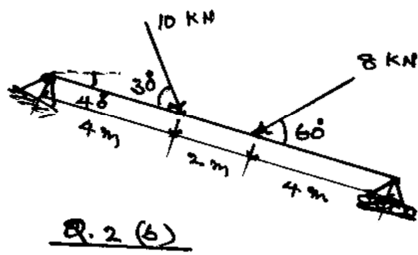
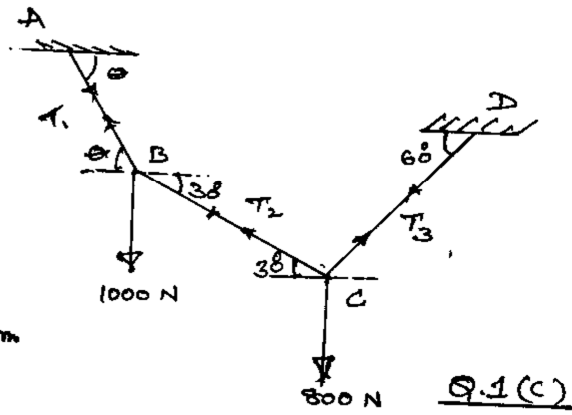
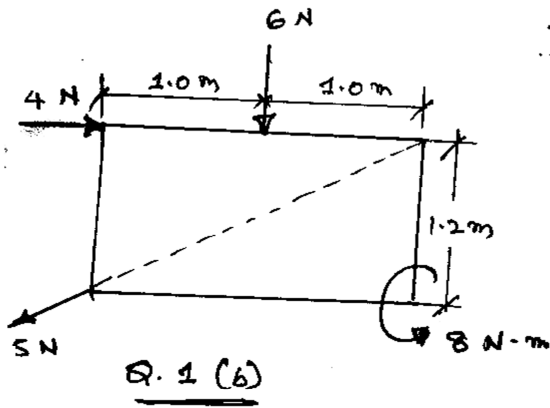
- 5 a. Explain moment of Inertia and Radius of Gyration. 6
- b State and prove parallel axis theorem. 6
 - c. Determine the moment of Inertia of I-section shown in Fig. Q 5(c) about horizontal and vertical centroidal axis. 8
- 6 a. Define polar moment of inertia and section modulus. 6
- b. State and prove perpendicular axis theorem. 6
 - c. Find the moment of Inertia of a section about the centroidal axis parallel to the base as shown in Fig. Q 6(c). 8

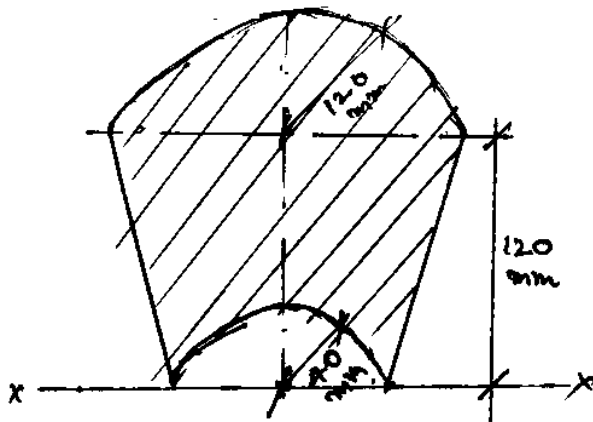
UNIT - IV

- 7 a. Explain Angle of Friction and laws of friction. 6
- b. A body resting on a rough horizontal plane required a pull of 180 N inclined at 30° to the plane just to move it. It was found that a push of 220 N inclined at 30° to the plane just to move the body. Determine the weight of the body. 8
- c. A uniform ladder 5 m long weighs 300 N is at rest against a smooth vertical wall at one end and a rough horizontal floor at the other end. The coefficient of friction between ladder and floor is 0.4. What should be the inclination of the ladder with the vertical, so that man weighting 600 N can reach at the top of the ladder? 6
- 8 a. Explain angle of repose and cone of friction. 6
- b. A block 6000 N is resting on a 30° inclined surface as shown in Fig. Q 8(b). Determine the magnitude of a horizontal force P requires to cause impending motion of the block up the plane. 6
- c. Two blocks are placed as shown in Fig. Q 8(c) weight of block A is 5 km and of block B is 4 kN. The coefficient of friction between all contact surfaces is 0.2. Find the effort required to start moving block B and also tension in the cable. 8

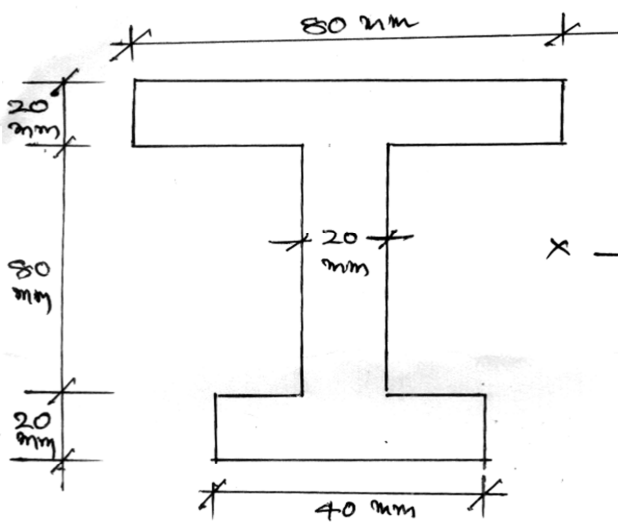
UNIT - V

- 9 a. Explain the term dynamics and projectiles. 6
- b. A motorist travelling at a speed of 70 kmph suddenly applies brakes and comes to a stop after skidding 50 m. Determine; i) The time required to stop the car ii) The coefficient of friction between the tyres and the road. 6
- c. A soldier fires a bullet at an angle of 30° (upward from horizontal) from its position on a hill to strike a target which is 60 m lower than the position of the soldier. The initial velocity of bullet is 90 m/s. Calculate; 8
- i) Maximum height to which the bullet will rise above the horizontal.
- ii) The actual velocity with which it will hit the target.
- iii) The time required for the flight of the bullet.
- 10a. Define Work, Power and Energy. 6
- b. Explain Law of conservation of momentum. 6
- c. A tram car weighs 100 kN, the tractive resistance being 5 N/kN. What power will be required to propel the car at a uniform speed and 27 KMPH? 8
- i) On level surface
- ii) Up an incline of 1 in 250 and
- iii) Down an incline of 1 in 250
- Take efficiency of motor as 75%

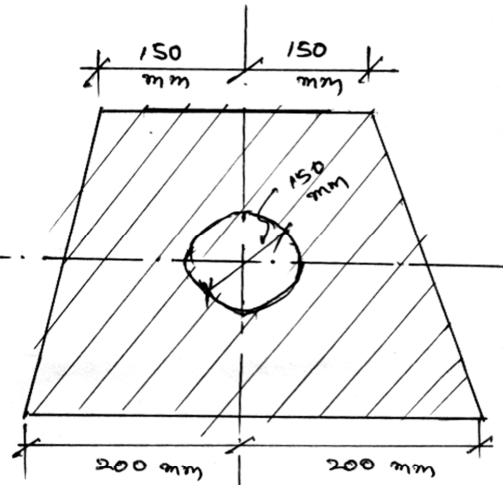




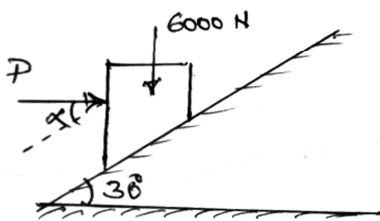
Q. 4(C)



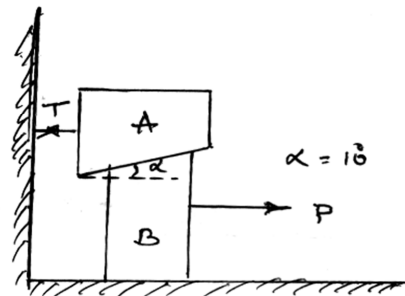
Q: 5(C)



Q: 6(C)



Q: 8(b)



Q 8(c)
