PVP 20

Code: 20BS1304

II B.Tech - I Semester – Regular Examinations - FEBRUARY 2022

APPLIED MECHANICS
(CIVIL ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

UNIT – I

1. a) Two forces of 80N and 70N act simultaneously at a point making an angles with horizontal of 40^0 and 30^0 respectively. Find the resultant force. 7 M

b) Explain how will you reduce the system of coplanar, non-concurrent forces to a force and a couple. 7 M

OR

2. a) A 100kg box is shifted by two persons, one pulling it exerting a force of 200N inclined at 20^0 to the horizontal and another pushing it from behind by exerting a force of 150N inclined at 10^0 to the horizontal. Determine the resultant force acting on the box as shown in Fig. 1. 7 M

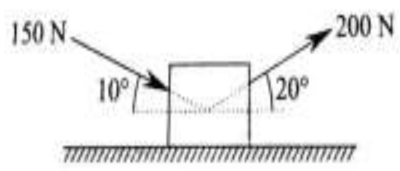

Fig. 1

b) State and explain triangle law of forces, polygon law of forces. 7 M

UNIT – II

3. a) Write briefly about types of supports, loads and beams. 7 M

b) Two smooth cylinders with diameters 250 mm and 400 mm respectively are kept in a groove with slanting surfaces making angles 60^0 and 30^0 as shown in the Fig. 2. Determine the reactions at contact points A, B and C. 7 M

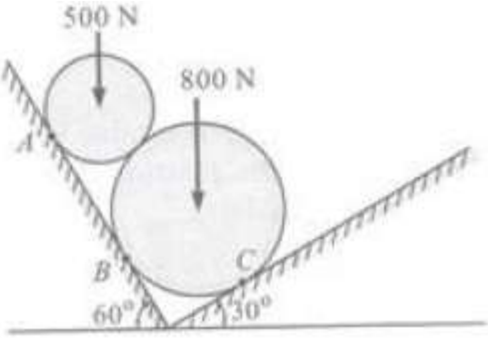

Fig. 2

OR

4. a) Find the reactions for the simply supported beam for Fig.3. 7 M

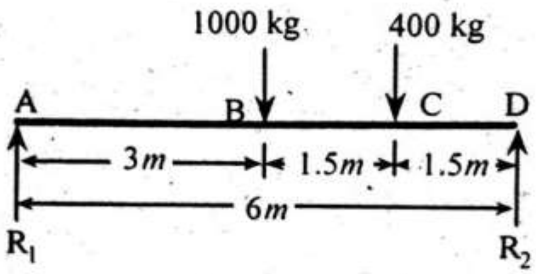

Fig. 3

b) A cantilever beam AB of span 4m, which is fixed at A and free at B. It carries uniformly distributed load of 16kN/m, 2m from point A. It carries point load of 20kN, 12kN and 10kN at distance of 2m, 3m and 4m from point A. Determine the reactions at A. 7 M

UNIT-III

5. a) A truss is loaded as shown in Fig. 4. Find the forces in members AB, BD and BC. AC=6m 7 M

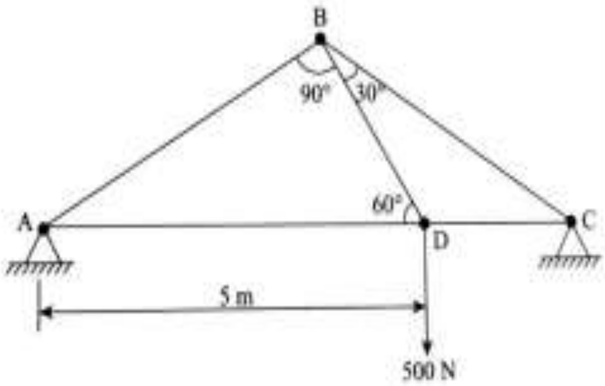

Fig. 4

b) Find the forces in members EC, DC and DH of the truss shown in Fig.5. 7 M

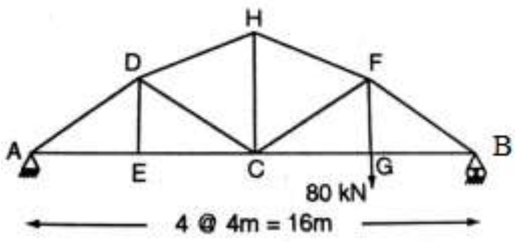

Fig. 5

OR

6. a) Define angle of friction and angle of repose. 7 M

b) A ladder 6 m long has a mass of 18 kg and its center of gravity is 2.4 m from the bottom. The ladder is placed against a vertical wall so that it makes an angle of 60° with the ground. How far up the ladder can a 72-kg man climb before the ladder is on the verge of slipping? The angle of friction at all contact surfaces is 15°. 7 M

UNIT – IV

7. a) Find the centroid of the L- section shown in Fig.6. 7 M

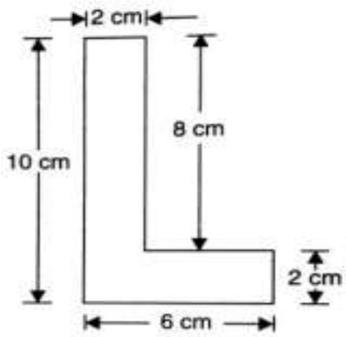

Fig. 6

b) Derive an equation for moment of inertia of a Rectangle. 7 M

OR

8. a) Determine moment of inertia of given Fig.7 about centroidal XX axis. 7 M

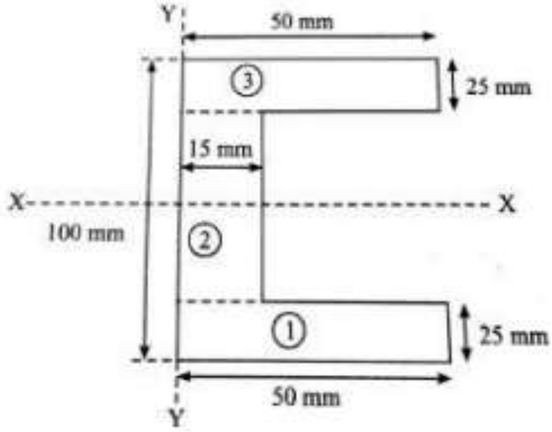

Fig. 7

b) Determine the centroid of the quarter-circle whose radius is R. 7 M

UNIT – V

9. a) Two trains P and Q leave the same station on parallel lines. Train P starts at rest with uniform acceleration of 0.2 m/s^2 attains a speed of 10 m/s. Further the speed is kept constant. Train Q leaves 30 seconds later with uniform acceleration of 0.5 m/s^2 from rest and attains a maximum speed of 20 m/s, when will train Q overtake train P. 7 M

b) A ball is thrown vertically upwards from the ground with an initial velocity of 20m/s. Determine i) the maximum height reached by the ball, ii) the time taken to reach the maximum height, and iii) the total time of flight. 7 M

OR

10. Two blocks A and B are connected with an inextensible but flexible string, as shown in Fig.8. Let the system be released from rest. Determine the velocity of the block A after it has moved a distance of 0.7m. Assume that the coefficient of friction between block A and the plane is 0.31. The masses of the blocks are m_A=95kg and m_B=143kg. 14 M

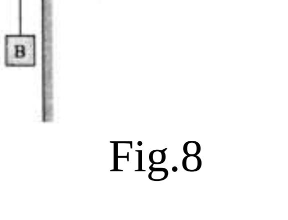

Fig.8