PVP 12

Code: CE3T3

II B.Tech - I Semester – Regular Examinations - December 2014

MECHANICS OF SOLIDS-I
(CIVIL ENGINEERING)

Duration: 3 hours Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1. a) Derive the relationship between young's modulus and rigidity modulus of a material. 7 M

   b) Three bars made of copper; zinc and aluminium are of equal length and have cross section 500, 750, and 1000 sq.mm respectively. They are rigidly connected at their ends. If this compound member is subjected to a longitudinal pull of 250kN, estimate the load carried on each rod and the induced stresses. Take the value of E for copper = 1.3×10^5 N/mm^2, for zinc = 1×10^5 N/mm^2 and for aluminium = 0.8×10^5 N/mm^2. 7 M

2. a) What is strain energy of a material? What is its significance? 7 M

   b) An unknown weight falls through 300mm on a collar rigidly attached to the lower end of a vertical rod, 2 m long and 100mm diameter. If the maximum instantaneous extension of the rod is 10mm, calculate the stress induced and the magnitude of the unknown weight. Take $E = 2 \times 10^5$ N/mm^2. 7 M

3. a) Mention and sketch any two types of supports for the beams. 7 M

b) Draw the shear force and bending moment diagrams for the beam shown in Figure-1. Also determine the maximum bending moment and location of point of contra flexure. 7 M

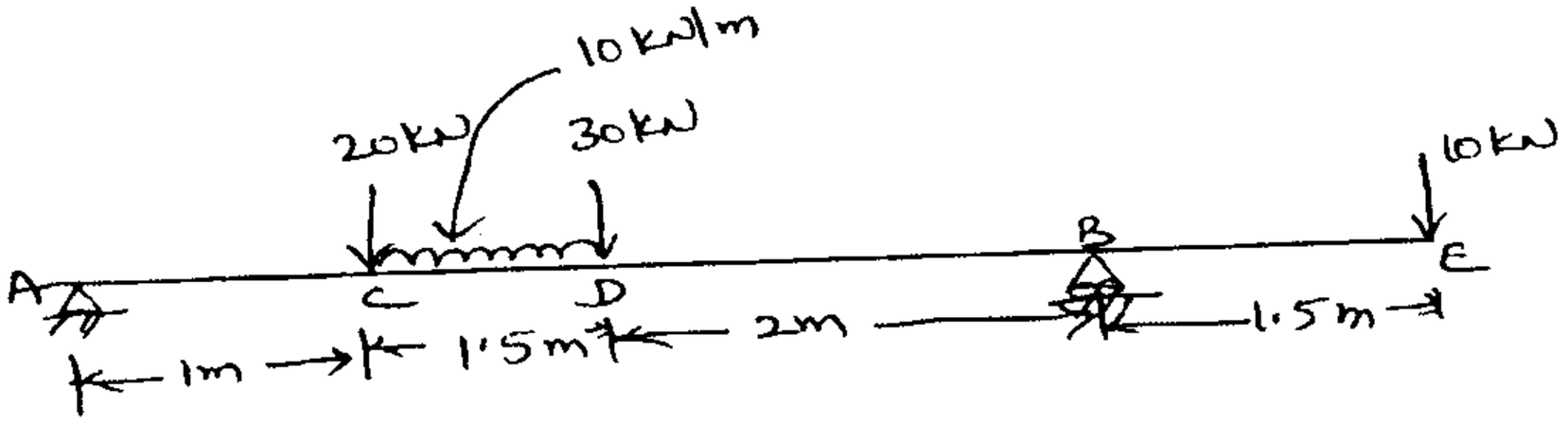

Figure -1

4. a) State the assumptions involved in the theory of simple bending. 7 M

b) A rectangular beam 250mm wide and 400mm deep is simply supported over a span of 4m and carries a load of 5kN/m. It also carries three equal point loads W kN each equispaced over the beam. If the permissible bending stress is 10MPa, find the maximum allowable value of W. 7 M

5. a) Sketch the shear stress distribution across the circular section of diameter 'D' with salient features. 7 M

b) A beam of triangular cross section having base width of 150 mm and height of 150 mm is subjected to a shear force of 20 KN. Find the value of maximum Shear stress, and sketch the shear stress distribution along the depth of beam. 7 M

6. a) A shaft of diameter 'd' is subjected to a combined moment, M and twisting moment, T at a section. Calculate the principal stresses and the maximum shear stress in the shaft. 7 M

b) Find the power transmitted by a shaft of 10cm diameter at 200 R.P.M. If the permissible shear stress is $65N/mm^2$. 7 M

7. a) Explain Macaulay's method of beam deflection analysis, and discuss its advantages. 7 M

b) A beam of length 6 m is simply supported at the ends and carries two point loads of 30 kN and 50 kN at a distance of 1 m and 3 m respectively from the left support. Compute the slope and deflection under each load. Assume $EI = 17000\ kN–m^2$. 7 M

8. a) Define principal stresses and principal strains. 7 M

b) A point in a strained material is subjected to a tensile stress of $70\ N/mm^2$ and a Compressive stress of $50\ N/mm^2$ acting on two mutually perpendicular planes and a shear stress of $30N/mm^2$ is acting on these planes. Find the normal stress, tangential stress and resultant stress on a plane inclined at 30^0 with the plane of the compressive stress. Determine the principal stresses and the Planes on which they act. 7 M