B.E. / B.Tech. (Civil Engineering) Model Curriculum Semester-IV

PCC-CE404 - Strength of Materials

P. Pages : 2 **GUG/W/24/13718**

Time : Three Hours * 5 3 9 5 * Max. Marks : 80

Notes : 1. All questions carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) i) Define elasticity and plasticity? **8**
ii) State Hooke's law with equation?
iii) Define the terms Factor of Safety and Poisson ratio?
iv) What is the deference between Resilience and Proof Resilience?

b) A brass bar, having cross-sectional area of 1000 mm^2, is subjected to axial forces as shown in figure 1. Find the total elongation of the bar. Take E=l.05x105 N/mm^2. **8**

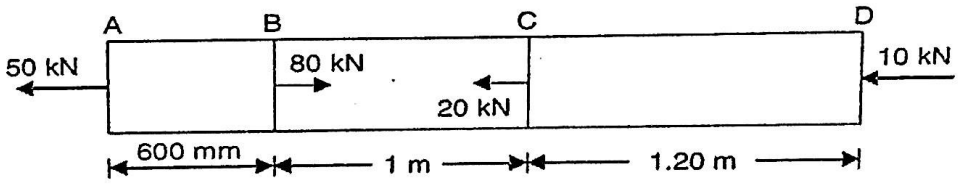

Figure 1

OR

2. a) Explain stress strain curve for ductile material. **7**

b) A load of 800 kN is applied to a reinforced concrete column of 560-mm diameter which has four steel rods of 36-mm diameter embedded in it. Determine the stress in the concrete and the steel. Take E for steel 210 GPa and E for concrete= 15 GPa. Also, find the adhesive force between the concrete and the steel. **9**

3. a) Derive the relation between load, shear force and bending moment. **6**

b) A 10-m long simply supported beam carries two-point loads of 10 kN and 6 kN at 2 m and 9 m respectively from the left end. It also has a uniformly distributed load of 4 kN/m run for the and 7 m from the left end. Draw shear force and bending moment diagrams. **10**

OR

4. a) Explain the concept of point of contraflexure with help of neat sketch. **6**

b) A cantilever of 14-m span carries loads of 6 kN, 4 k.N, 6kN and 4 kN at 2 m, 4m, 7 m and 14 m respectively from the fixed end. It also has a uniformly distributed load of 2 kN/m run for the length between 4 m and 8 m from the fixed end. Draw the shear force and bending moment diagrams. **10**

5. a) Derive bending equation. **7**

b) A timber beam of rectangular section is to support a load of 30 kN/m uniformly distributed over a span of 4 m when beam is simply supported. If the depth of section is to be twice the breadth, and the stress in the timber is not to exceed 8 N/mm^2, find the dimensions of the cross section. **9**

OR

6. a) Derive the formula for shear stress at a section. **7**

b) A beam of cross - section or an isosceles triangle is subjected to a shear force of 45 kN at a section where base width= 125 mm and height= 400 mm. **9**
Determine: (i) Horizontal shear stress at the neutral axis.
(ii) The distance from the top to the beam where shear stress is maximum and
(iii) Value of maximum shear stress.

7. a) Derive torsion equation. **8**

b) A hollow shaft of external diameter 120 mm transmits 300 kW power at 200 r.p.m. Determine the maximum internal diameter if the maximum stress in the shaft is not exceeded to 60 N/mm^2. **8**

OR

8. A beam of length 8 m is simply supported at its ends and carries two-point loads of 36 kN and 46 kN at a distance of 1.5 m and 4 m from the left support. **16**
Find: (i) deflection under each load.
(ii) Maximum deflection and
(iii) The point at which maximum deflection occurs,
given E = 2 x 105 N/mm^2 and I= 85 x 106 mm^4.

9. The stresses on two mutually perpendicular planes through a point in a body are 120 MPa and 30 MPa both tensile along with a shear stress of 60 MPa. Determine (i) the magnitude and direction of principal stresses stating whether the stress condition is uniaxial or biaxial (ii) the planes of maximum shear stress (iii) the normal and shear stresses on the planes of maximum shearing stress. **16**

OR

10. a) Explain the concept of shear centre with help of neat sketch. **6**

b) Derive the differential equation of equilibrium stress in two-dimensional state of stress **10**

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