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21ENG/ARC36

Third Semester B.Arch. Degree Examination, Dec.2024/Jan.2025
Building Structures – II

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Explain the different types of stresses and strains with neat sketches. **(10 Marks)**

b. A brass bar, having cross-sectional area of 2000 mm^2, is subjected to axial forces as shown in Fig.Q.1(b). Find the total elongation of the bar. Take E = 1.05 × 10^5 MPa.

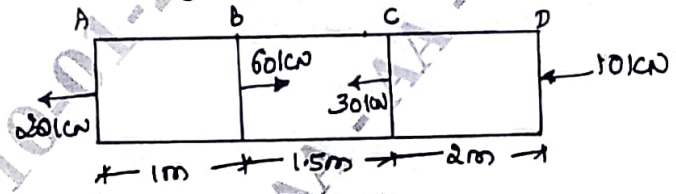

Fig.Q.1(b)

(10 Marks)

OR

2 a. Define:
- i) Ductility and brittleness
- ii) Elasticity
- iii) Hook's law
- iv) Poisson's ratio
- v) Factor of safety. **(10 Marks)**

b. A stepped bar circular cross-section 3 m length is subjected to an axial of 70 kN. Find the stress, strain and deformation in each section. Also find the total deformation. Take E = 200 GPa. **(10 Marks)**

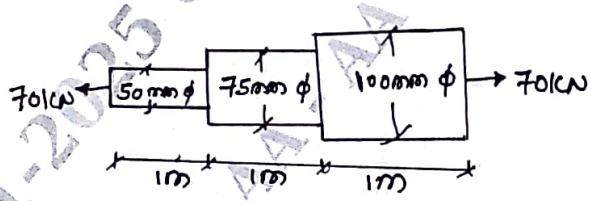

Fig.Q.2(b)

Module-2

3 a. Explain the terms-Young's modulus, shear modulus and bulk modulus. Also write the relation between the 3 elastic constants E, G and K. **(10 Marks)**

b. A bar of 50 mm diameter is subjected to a pull of 80 kN. The measured extension of length of 250 mm bar is 0.15 mm and change in diameter is 0.0025 mm. Determine :
- i) Longitudinal strain and lateral strain
- ii) Young's modulus
- iii) Poisson's ratio
- iv) Bulk modulus. **(10 Marks)**

OR

4 a. Explain temperature effects on structures. **(10 Marks)**

b. State the expression for elongation of a uniformly tapering circular bar subjected to axial tension with usual notations. **(10 Marks)**

Module-3

5 a. State and explain Euler's formula for long columns. **(10 Marks)**

b. A column of timber section 20 cm × 30 cm is 8 m long, both ends being fixed. If the Young's modulus for timber is 17.5 kN/mm^2, determine:

i) Crippling load

ii) Safe load for the column if factor of safety is 3. **(10 Marks)**

OR

6 a. What are the assumptions made in Euler's column theory? Also explain the limitations of Euler's theory. **(10 Marks)**

b. A hollow alloy tube 5 m long with external and internal diameters 40 mm and 30 mm respectively was found to extend by 5 mm under a tensile load of 80 kN. Find the buckling load for the tube when used as a column with both ends hinged. Also find the safe load for the tube, taking a factor of safety = 3. **(10 Marks)**

Module-4

7 a. Explain the following with neat sketches:

i) Shear force and bending moment.

ii) Shear force diagram and bending moment diagram.

iii) Pure bending and point of contraflexure. **(10 Marks)**

b. Draw the SFD and BMD for a cantilever beam shown in Fig.Q.7(b). **(10 Marks)**

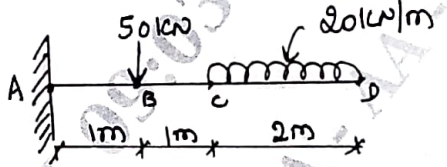

Fig.Q.7(b)

OR

8 a. A cantilever of length 3 m carries a UDL of 10 kN/m run over the whole length and a point load of 5 kN at a distance of 1 m from free end. Draw SFD and BMD. **(08 Marks)**

b. The simply supported beam shown in Fig.Q.8(b) carries 2 concentrated load and a UDL. Draw the SFD and BMD.

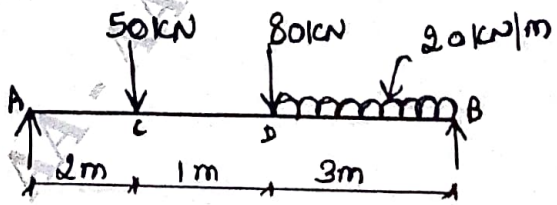

Fig.Q.8(b)

(12 Marks)

Module-5

9 a. Write the bending equation for the beams and expand each of the notations in the equation. Also write the assumptions used in the simple bending equation. **(10 Marks)**

b. A cast iron T-section has a length of 3 m and is subjected to a point load of 50 kN as shown in Fig.Q.9(b). Determine the maximum tensile and maximum compressive stress. **(10 Marks)**

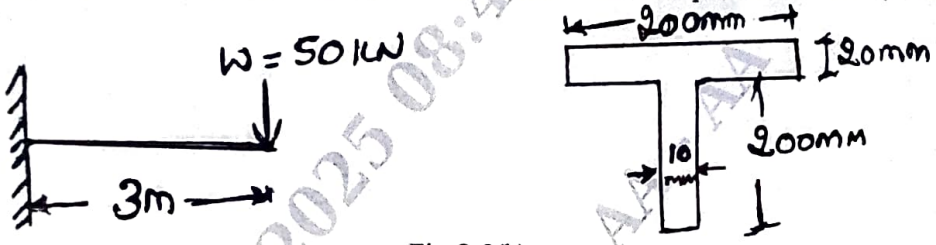

Fig.Q.9(b)

OR

10 a. Define:
i) Neutral axis
ii) Section modulus
iii) Pure bending **(06 Marks)**

b. A cantilever of length 2 m fails when a load of 5 kN is applied at the free end. If the beam is 50 mm × 50 mm, find the stress at the failure. **(06 Marks)**

c. A beam of an I-section consists of 200 mm × 20 mm flanges and a web of 300 mm depth and 15 mm thickness is subjected to a shear force of 50 kN. Draw the shear stress variation diagram across the depth. Take $I = 200 \times 10^6$ mm^4. **(08 Marks)**

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