21ENG36/21ARC36

Third Semester B. Arch. Degree Examination, June/July 2023
Building Structures – II

Time: 3 hrs.
Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*
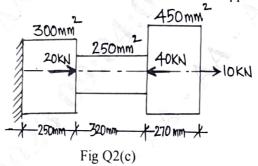
Module-1

1 a. Draw stress strain curve for mild steel subjected to axial tension and explain all the salient points. **(08 Marks)**

   b. The following data refer to mild steel specimen tested in tension. Diameter of specimen = 25mm, initial guage length 300mm, final guage length 360mm, extension observed under a load of 20kN is 0.060mm, yield load 150kN, load at failure 252kN neck diameter at failure 18.25mm. Determine: i) Young's modulus ii) Yield stress iii) Nominal ultimate stress iv) Actual ultimate stress v) Percentage elongation vi) percentage reduction in area. **(12 Marks)**

OR

2 a. Briefly explain the principle of superposition. **(04 Marks)**

   b. Write an expression each for elongation of uniformly varying rectangular bar with constant thickness and of uniformly varying circular bar subjected to axial tension. **(06 Marks)**

   c. A stepped bar with 3 different portion has fixed support at one of its ends. The stepped bar is subjected to forces as shown in Fig Q2(c). Determine the stresses and deformation induced in each portion. Also find the net deformation induced in the stepped bar. Take E = 200 GPa.

Fig Q2(c)
(10 Marks)

Module-2

3 a. Define and explain longitudinal strain, lateral strain and volumetric strain. **(08 Marks)**

   b. A load of 300kN is applied on a short column 250mm × 250mm. The column is reinforced by steel bars of total area 5600mm^2. If $E_s = 15E_c$, find the stresses in steel and concrete. If the stress in concrete should not exceed 4N/mm^2, find the area of steel required so that the column may support a load of 600kN. **(12 Marks)**

OR

4 a. Define Elastic constants. **(08 Marks)**

   b. A 500mm long bar has rectangular cross section 20mm × 40mm. This bar is subjected to
      i) 40kN tensile force on 20mm × 40mm face
      ii) 200kN compressive force on 20mm × 500mm face
      iii) 300kN tensile force on 40mm × 500mm face
      Find the change in volume if E = 2 × 10^{5}N/mm^2 and μ = 0.3. **(12 Marks)**

Module-3

5   a.   Define effective length of column and give the effective length of the column with different end conditions.   **(10 Marks)**

b.   A solid round bar 3m long and 50mm in diameter is used as steel strut and $E = 2 \times 10^5 N/mm^2$. Determine crippling load when
   i) Both end are hinged
   ii) One end fixed and other end free
   iii) Both ends fixed.   **(10 Marks)**

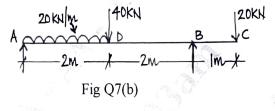### OR

6   a.   Explain the limitation of Euler's theory.   **(06 Marks)**

b.   Determine crippling load for an I-section with $400 \times 200 \times 10mm$ size having length of 6m used as a strut with both ends fixed. $E = 2.1 \times 10^5 N/mm^2$ F.S = 3.   **(14 Marks)**

Module-4

7   a.   Define : i) Shear force   ii) Bending moment   iii) Shear force diagram   iv) Bending moment diagram   v) Point of contra flexure   **(10 Marks)**

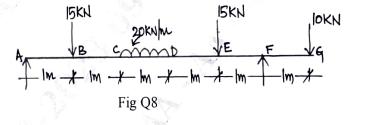b.   Draw SFD and BMD for simply supported beam shown in Fig Q7(b)

Fig Q7(b)   **(10 Marks)**

OR

8   Draw SFD and BMD for beam shown in Fig Q8 and mark the salient points. Find the point of contraflexure and maximum bending moment.

Fig Q8   **(20 Marks)**

Module-5

9   a.   Write the bending equation for the beams and expand each of the notations.   **(08 Marks)**

b.   Calculate and draw the bending stress variation for a beam section shown in Fig Q9(b).
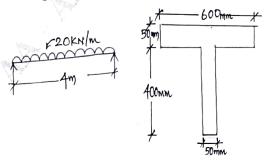

Fig Q9(b)   **(12 Marks)**

OR

10 a. Write the section modulus with neat sketches for i) Rectangle   ii) Hollow rectangle
iii) Circle iv) Hollow circle.   **(08 Marks)**

   b. Draw the shear stress variation diagram across the depth for a beam section shown in Fig
Q10(b), if the shear force at section is 60kN.

Fig Q10(b)   **(12 Marks)**

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