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18ENG25

Second Semester B.Arch. Degree Examination, July/August 2021
Building Structures II

Time: 3 hrs.

Max. Marks: 100

Note: *Answer any FIVE full questions.*

1 a. State and explain 'Poisson's ratio'. **(04 Marks)**
   b. A bar 2000mm long and 30mm dia is subjected to an axial pull of 30kN. If E of the material is 2.0×10^5 N/mm^2, calculate:
       i) Stress
       ii) Elongation of the bar
       iii) Strain. **(06 Marks)**
   c. An axial pull of 40kN is acting on a bar consisting of three sections of length 300mm, 250mm, and 200mm of dia 20mm, 40mm and 50mm respectively. E = 2×10^5 N/mm^2. Calculate:
       i) Stress in each section
       ii) Total elongation of the bar. **(10 Marks)**

2 a. State the relationship between elastic constants. **(05 Marks)**
   b. A rod which tapers uniformly from 50mm dia to 30mm dia in a length of 500mm is subjected to an axial pull of 6000N. E = 200kN/mm^2, calculate the elongation of the bar. **(05 Marks)**
   c. Calculate the dia 'D' of the bar shown Fig Q2(c) if the total elongation of the ABCD is 1.65mm.   E = 2×10^5N/mm^2, All dimensions in 'mm'

Fig Q2(c)

(10 Marks)

3 a. Define 'bending moment' and 'Shear Force' at any section of a beam. **(03 Marks)**
   b. Draw SFD and BMD for the beam shown in Fig Q3(b)

Fig Q3(b)

(07 Marks)

   c. Draw SFD and BMD for the beam shown in Fig Q3(c). Indicate the salient values.

Fig Q3(c)

(10 Marks)

4 a. Define "Bending moment diagram" "Shear Force" and "point of contrflexture". (06 Marks)
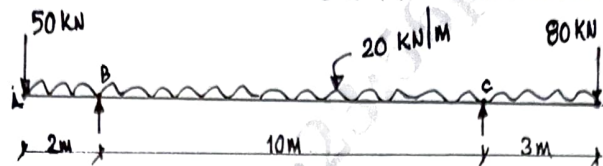   b. Draw SFD and BMD for the beam shown in Fig Q4(b). Indicate the salient values.

Fig Q4(b) (14 Marks)

5 a. State and explain simple bending equations. (03 Marks)
   b. State and explain shear stress equation. (03 Marks)
   c. A rectangular beam of width 250mm and depth 480mm is used to support a bending moment of 200kNm and a shear force of 150kN. Sketch the variation of bending stress and shear stress across the cross-section of beam. (14Marks)

6 a. Define "Simple bending" with an example. (04 Marks)
   b. Explain "Section Modulus" with an example. (04 Marks)
   c. A T-beam of flange 100×15mm and web 20×120mm is subjected to a bending moment of 20kNm and a shear force of 18kN. Sketch the variation of bending stress and shear stress. (12 Marks)

7 a. State the expressions for "Effective length of columns" for various end conditions, with neat sketches. (Four standard cases). (08 Marks)
   b. Calculate the safe load on a hollow cast iron column of 100mm external dia and 70mm internal dia and length 8mt, with one end fixed other end hinged. E = 95kN/mm². Factor of safety 4. (12 Marks)

8 a. State the assumptions made in the Euler's theory for critical load on long columns. (06 Marks)
   b. Explain the classification of columns based on "Failure of columns". (04 Marks)
   c. A column of timber section 100×150mm is 5000mm long with both ends fixed. Calculate :
       i) Crippling load on column
       ii) Safe load on the column
       E = 17.5kN/mm², Factor of safety 3. (10 Marks)

9 a. Define "Slope" and "Deflection" of a beam with a sketch. (08 Marks)
   b. Calculate the deflection at the free end of the over – hanging beam shown in Fig Q9(b).

Fig Q9(b) (12 Marks)

10 Calculate the slope at the supports and deflection under the loads for the beam shown Fig Q10. E = 2 × 10⁸ kN/m², I = 0.0003m⁴.
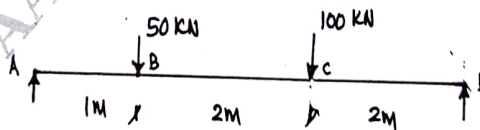

Fig Q10 (20 Marks)

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