USN | | | | | | | | | | |

18ENG25

Second Semester B.Arch. Degree Examination, Jan./Feb.2021
Building Structures – II

Time: 3 hrs. Max. Marks: 100

Note:1. ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. Missing data may be assumed suitably and mentioned.

Module-1

1 a. With help of neat sketch, explain briefly the stress-strain relationship of MILD steel specimen. **(06 Marks)**

b. An axial pull of 140 kN is acting on a bar consists of three length as shown in Fig. Q1 (b). If the Young's modulus = 2.1×10^5 N/mm^2. Determine the (i) Stresses in each segment (ii) Total extension of bars. **(08 Marks)**

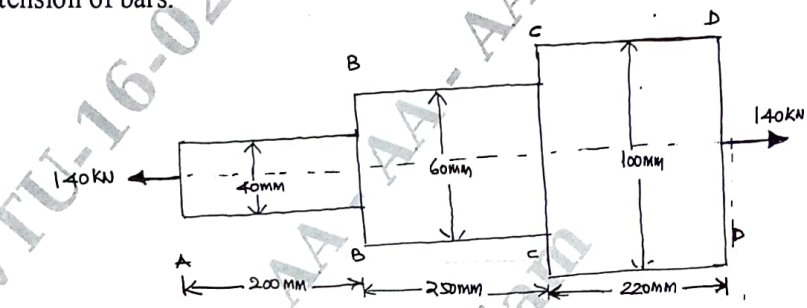

Fig. Q1 (b)

c. A brass bar having cross sectional area 300 mm^2 is subjected to axial forces as shown in Fig. Q1 (c). If E = 84 GPA. Find the total elongation of the bar. **(06 Marks)**

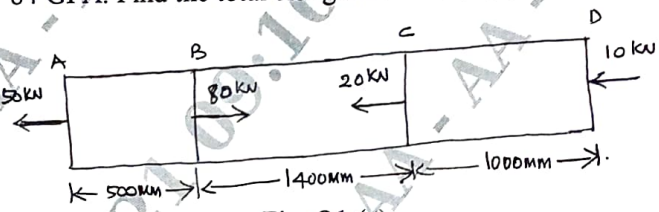

Fig. Q1 (c)

OR

2 a. A round bar with stepped portion is subjected to forces as shown in Fig. Q2 (a). Determine the magnitude of force 'P', such that net deformation in the bar, does not exceed 1 mm. Young's modulus of steel – E_{steel} = 200 GPa and that of Aluminium is 70 GPa. **(10 Marks)**

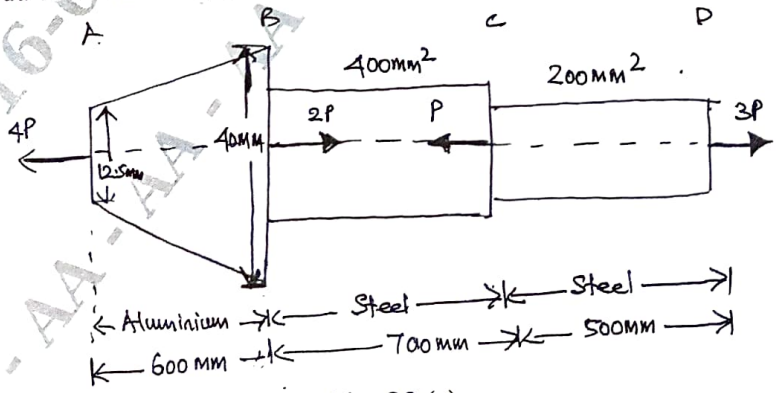

Fig. Q2 (a)

b. A reinforced short concrete column 250mm × 250mm in section is reinforced with 8 steel bars. The total area of steel bars is 1608.5 mm^2. The column carries a load of 270 kN. If the modular ratio is 18. Find the stresses in concrete and steel. **(10 Marks)**

Module-2

3 a. Explain briefly (i) Bending moment (ii) Shear force (iii) Point of contraflexure **(06 Marks)**

b. Draw the shearing force diagram and bending moment diagram for a simply supported beam of span L mts subjected to a udl of W kN/mt over the entire span. **(07 Marks)**

c. Draw the SFD and BMD for the cantilever beam shown in Fig. Q3 (c) **(07 Marks)**

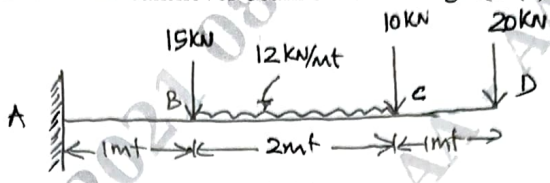

Fig. Q3 (c)

OR

4 Draw the SFD and BMD in the following cases:
Refer Fig. Q4 (a) and Fig. Q4 (b)

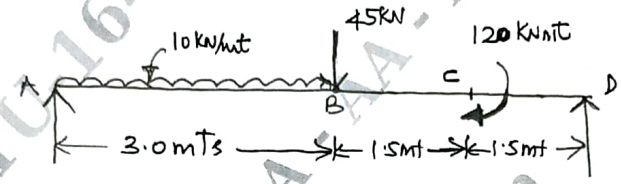

Fig. Q 4(a)

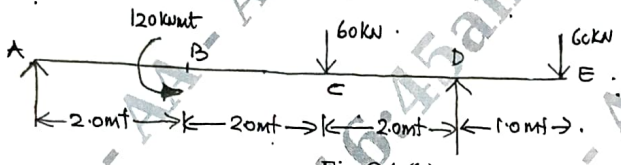

Fig.Q4 (b) **(20 Marks)**

Module-3

5 a. What are the assumption and made in the bending theory? **(03 Marks)**

b. What is section modulus? Obtain the expression for section modulus of,
(i) Rectangular cross section.
(ii) Circular section.
(iii) Hollow circular section. **(07 Marks)**

c. The T section in Fig. Q5 (c) is used as a simply supported beam over a span of 4 mts. It carries a udl of 8 kN/mt over its entire span. Calculate the maximum tensile and compressive stresses occurring in the section. **(10 Marks)**

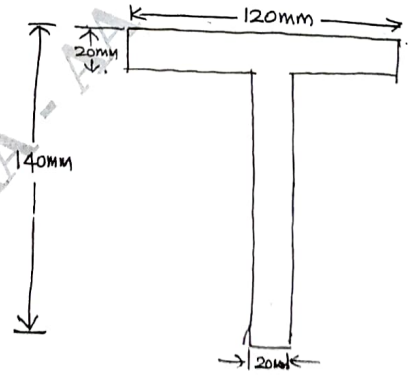

Fig. Q5 (c)

OR

6 a. Prove that for a rectangular section, that maximum shear stress is 1.5 average shear stress. **(10 Marks)**

b. A simply supported beam carries a uDL of 50 kN/mt over the entire span of 6 mts length. The cross section is shown in Fig. Q5 (c). Determine the maximum shear stresses and sketch the shear stress across the cross section. **(10 Marks)**

Module-4

7 a. Explain the following briefly : **(03 Marks)**
(i) Effective length (ii) Slenderness ratio.

b. What are assumptions made in Euler's theory? **(05 Marks)**

c. What is the "Limitation of Euler's theory"? **(05 Marks)**

d. A solid round bar of 60 mm diameter and 2.5 mt is used as a strut. Find the safe compressive load for the strut if, (i) Both ends are hinged and factor of safety is 03. **(07 Marks)**

OR

8 a. A 1.5 mt long column has a circular cross section of 50 mm diameter, one end of the column is fixed in direction and position, and other end is free. Taking the FOS as 3, calculate the safe load using,

(i) Euler's formula taking $E = 1.2\times10^5\ N/mm^2$

(ii) Rankine's formula taking yield stress 560 N/mm^2 and $a = \frac{1}{1600}$. **(10 Marks)**

b. A hollow circular section 2.8 mt long column, one end fixed and hinged at other end. External diameter is 150 mm and thickness of wall is 15 mm. Rankine's constant = $\frac{1}{1600}$ and $\sigma_c = 550$ MPa. Compare the buckling loads, obtained by Euler's formula and Rankine's formula. Take E = 80 GPa. **(10 Marks)**

Module-5

9 Determine the deflection under the loads, maximum deflection and slope at the supports for a simply supported beam shown in Fig. Q9, values of $E = 2.1\times10^5\ N/mm^2$ and $I = 160\times10^7\ mm^4$. **(20 Marks)**

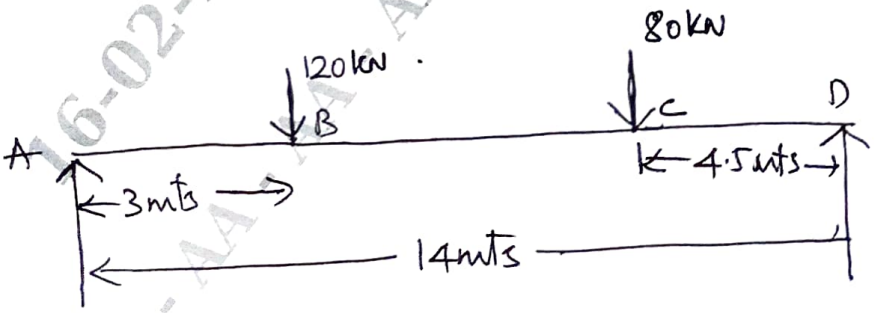

Fig. Q9

OR

10 a. For simply supported beam shown in Fig. Q10 (a), determine the maximum deflection. Find the ratio of maximum deflection to deflection at the point under one of the loads, in terms of EI. **(10 Marks)**

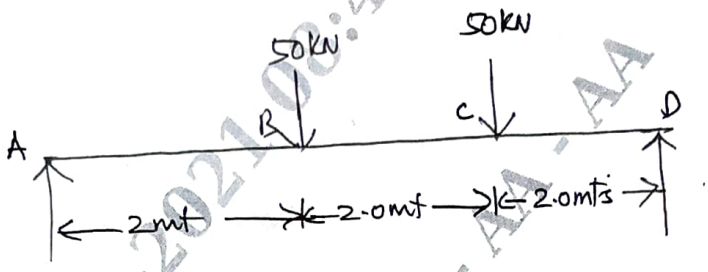

Fig. Q10 (a)

b. For Cantilever beam shown in Fig. Q10 (b), determine the deflection at B and D. $E = 1 \times 10^5 N/mm^2$, $I = 10 \times 10^7 mm^4$ **(10 Marks)**

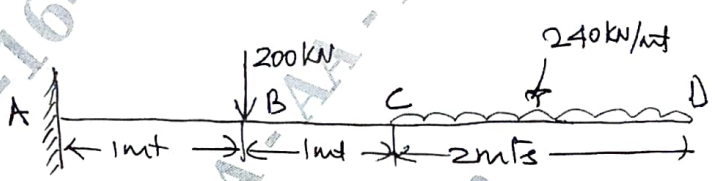

Fig. Q10 (b)

* * * * *