USN | | | | | | | | | | **15ENG25**

Second 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. From the 1st principles determine centroid of Quadrant of a circle.   **(10 Marks)**
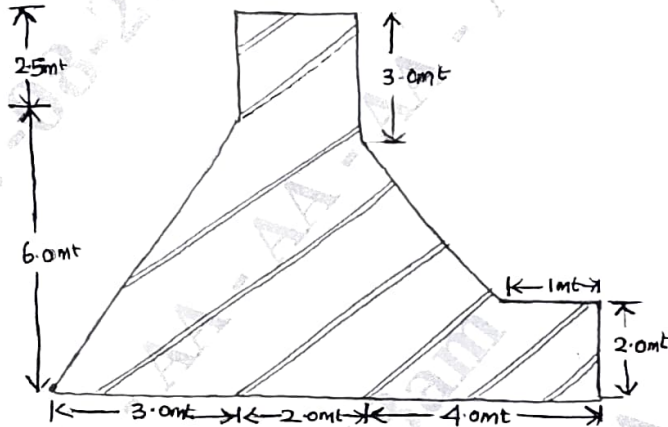   b. Determine the centroid of shaded portion in the Fig. Q1 (b).

Fig. Q1 (b)   **(10 Marks)**

OR

2   a. Determine the moment of inertia of Right Angled triangle about its base and about its centroidal axis.   **(10 Marks)**
     b. Determine the moment of inertia of channel section shown about its horizontal centriodal axis. (Refer Fig. Q2 (b)).   **(10 Marks)**
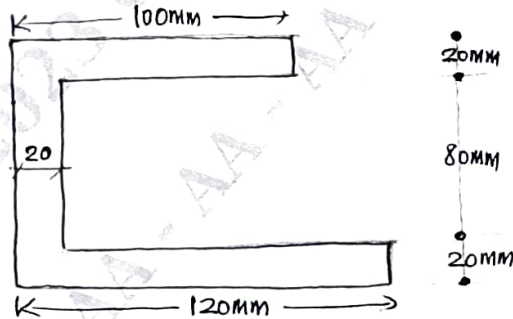

Fig. Q2 (b)

Module-2

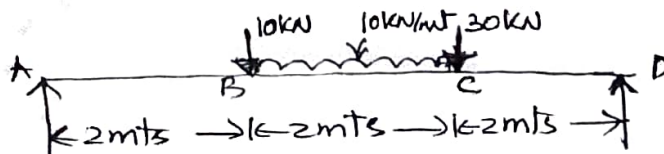3   a. Draw BMD and SFD for beam shown below in Fig. Q3 (a).   **(10 Marks)**

Fig. Q3 (a)

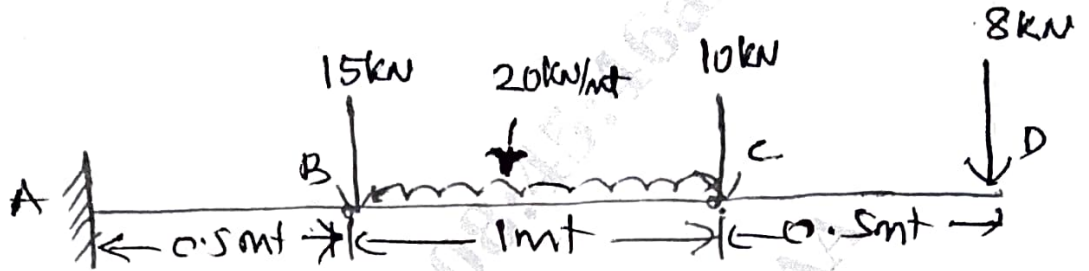b. Draw BMD and SFD for Cantilever shown in Fig. Q3 (b). **(10 Marks)**

Fig. Q3 (b)

OR

4 a. Obtain a relationship between load, SF and BM. **(06 Marks)**
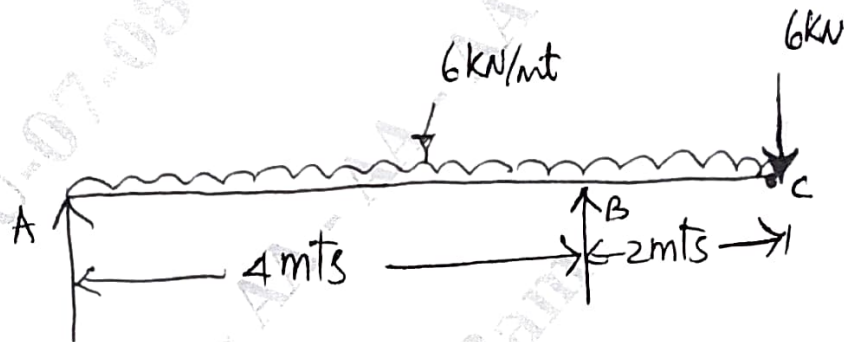   b. Draw BMD and SFD for the beam shown in the Fig. Q4 (b). **(14 Marks)**

Fig. Q4 (b)

Module-3

5 a. What are the assumptions made in simple bending theory? **(04 Marks)**
   b. Explain what is section modulus? Determine the section modulus of, Rectangular C/S, Circular C/S, Hallow Circular C/S, Hallow Rectangular C/S. **(08 Marks)**
   c. A Cast Iron bracket of I section with equal flanges is shown in Fig. Q5 (c). The beam carries an udl of 10 kN/mt on a span of 10 mts. Determine the position of neutral axis, MI about NA and maximum stress distribution. **(08 Marks)**
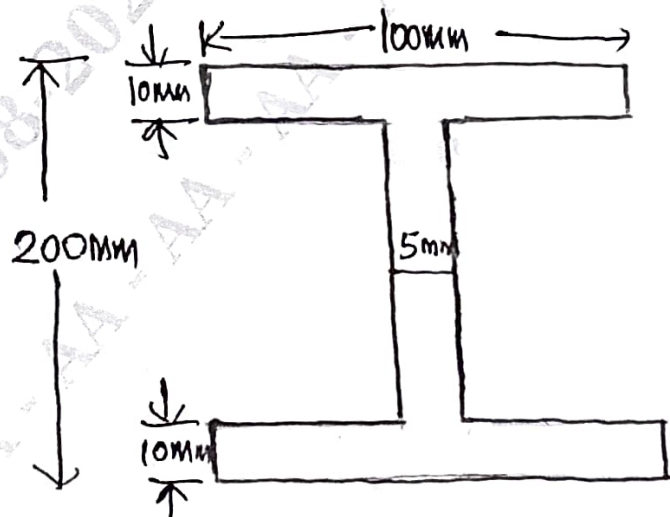

Fig. Q5 (c)

OR

6 a. For a Rectangular cross section of B and D, prove that maximum shear stress is 1.5 Average shear stress. **(10 Marks)**

b. For the sketches shown below determine the max. deflection and max slope. Refer Fig. Q6 (b) in terms of EI **(10 Marks)**
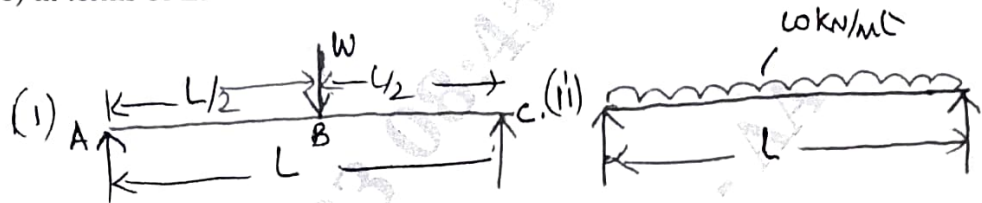

Fig. Q6 (b)

Module-4

7 a. From the fundamentals derive an expression for Eulers Buckling load of a column, when the ends are hinged. **(10 Marks)**

b. A 1.5 mt long column has a circular cross section of 50 mm diameter one end of column is fixed in direction and position and other end is free. Taking the Factor of Safety as 3. Calculate the safe load using, (i) Rankine's formula taking yield stress 560 N/mm^2 and $a = \dfrac{1}{1600}$. **(10 Marks)**

OR

8 a. What are limitations of Euler's theory? **(07 Marks)**

b. A Hollow circular section 2.8 mts long column is fixed at one end and hinged at the other end. External diameter is 150 mm and thickness of wall is 15 mm. Rankine constant = $\dfrac{1}{1600}$ and $\sigma_c = 550$ MPa. Compare the buckling loads obtained by using Euler's formula and Rankine's formula. Also find the length of column, for which both formulae gives the same load. Take E = 80 GPa. **(13 Marks)**

Module-5

9 a. As per IS456, write detailed recommendations given for column. **(08 Marks)**

b. Design a square column to carry a working load of 980 kN. Properties of materials are M$_{20}$ grade concrete and Fe415 grade steel. **(12 Marks)**

OR

10 The column has a cross section of 300 mm × 600 mm. Determine the load carrying capacity of short axially loaded column and also design the columns, if the properties of material are:
   (i)   M$_{20}$ grade concrete and Fe415 grade steel.
   (ii) M$_{25}$ grade concrete and Fe500 grade steel. **(20 Marks)**

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