Hall Ticket No | | | | | | | | | | |

Question Paper Code: ACEC07

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal-500043, Hyderabad

B.Tech IV SEMESTER END EXAMINATIONS (REGULAR / SUPPLEMENTARY) - AUGUST 2023
Regulation: UG-20
THEORY OF STRUCTURES

Time: 3 Hours **(CIVIL ENGINEERING)** **Max Marks: 70**

Answer ALL questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) State the degree of indeterminacy in propped cantilever with a neat sketch. Explain with an example. [BL: Understand| CO: 1|Marks: 7]

   (b) A propped cantilever AB of span 6 m is fixed at the end A and propped at the end B. It carries a point load of 50 kN at the mid span. Determine the reaction at the prop. Also draw SFD. [BL: Apply| CO: 1|Marks: 7]

MODULE – II

2. (a) Explain continuous beam with a neat sketch. Also state the theorem of three moments. List the advantages and limitations of the theorem of three moments [BL: Understand| CO: 2|Marks: 7]

   (b) A continuous beam ABC covers two consecutive span AB and BC of lengths 4 m and 6 m, carrying uniformly distributed loads of 6 kN/m and 10 kN/m respectively. If the ends A and C are simply supported, find the support moments at A, B and C. [BL: Apply| CO: 2|Marks: 7]

MODULE – III

3. (a) List the methods for finding out the slope and deflection of a beam. Summarize Mohr's theorem for slope and deflection. [BL: Understand| CO: 3|Marks: 7]

   (b) A horizontal beam of uniform section and 6 m long is simply supported at its ends. Two point loads of 48 kN and 40 kN are acting at 1 m and 3 m respectively from the left hand support. Determine the deflection under first load using Macaulay's method. Take $E = 200GN/m^2$ and $I = 85 \times 10^{-6}m^4$. [BL: Apply| CO: 3|Marks: 7]

4. (a) Discuss conjugate beam method. State the points to be considered for conjugate beam method. [BL: Understand| CO: 4|Marks: 7]

   (b) A cantilever beam of length 7 m carries a udl of 18 kN/m over a length of 3m from the free end along with a point load 2 kN at 3 m from the free end. Determine the deflection at the free end. Take $E = 2.1 \times 10^5 N/mm^2$ and $I = 1.2 \times 10^8 mm^4$. Use moment area method. [BL: Apply| CO: 4|Marks: 7]

MODULE – IV

5. (a) Elucidate perfect and redundant frame with an example. What are the assumptions made in analysis of a pin jointed plane truss? [BL: Understand| CO: 5|Marks: 7]

   (b) Analyze the truss as shown in Figure 1 by method of joints. [BL: Apply| CO: 5|Marks: 7]

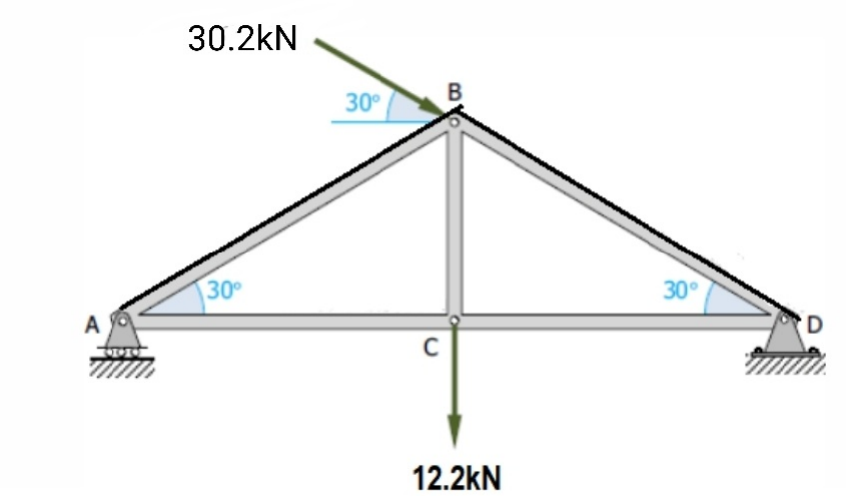

Figure 1

6. (a) State Castigliano's first and second theorems. Write the expression for strain energy due to axial load, shear and torsion. [BL: Understand| CO: 5|Marks: 7]

   (b) A beam of span 4 m is cantilever and subjected to a concentrated load 10 kN at free end. Find the total strain energy stored due to bending and also find the deflection under load. Take flexural rigidity as EI. [BL: Apply| CO: 5|Marks: 7]

MODULE – V

7. (a) Differentiate long column and short column. Mention the assumptions in the Euler's theory for long column [BL: Understand| CO: 6|Marks: 7]

   (b) A 4.5 m long cast iron column has a hollow circular cross section whose outside diameter is 200 mm has a thickness of 20 mm. It is fixed at both ends. Taking factor of safety as 3. Calculate the safe load using Rankines formula. Take $fc = 550MN/m^2$, a = 1/1600. [BL: Apply| CO: 6|Marks: 7]

8. (a) Determine the expression for Eulers crippling load when the both ends are hinged. [BL: Understand| CO: 6|Marks: 7]

   (b) A solid round bar 60 mm in diameter and 2.5 m long is used as a column. One end of the column is fixed and while other end is hinged. Find the safe compressive load of the column by using Euler's formula. Take E = $200GN/m^2$ and factor of safety as 3. [BL: Apply| CO: 6|Marks: 7]

– ∘ ∘ ◯ ∘ ∘ –