Total No. of Questions : 08

M.Tech (Structural Design) (Sem.-1) ADVANCED STRUCTURAL ANALYSIS Subject Code : MTSD-102 M.Code : 74243 Date of Examination : 16-01-23

Time: 3 Hrs.

INSTRUCTIONS TO CANDIDATES :

- 1. Attempt any FIVE questions out of EIGHT questions.
- 2. Each question carries TWENTY marks.
- 3. Missing data may be assumed suitably.

1. Answer the following :

- a) Write down the expression used for finding the forces in any member of pin jointed frame.
- b) How *jth* column of force transformation matrix is generated?
- c) Define R and R^{T} and how it related to each others.
- d) Load matrix in element approach of flexibility matrix is
- e) Define the flexibility and stiffness matrix.
- f) At element coordinates, why coordinates are assigned to rotation only?
- g) What types of stresses are developed in spherical domes?
- h) Define load factor and collapse load.
- i) Define plastic modulus of section.
- j) Define stress at fracture in term on plastic analysis.
- 2. Analyse the continuous beam shown in Fig. (1) by force method treating the support reaction at B and C as redundant and draw the bending moment diagram. (20)



Total No. of Pages : 03

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Max. Marks: 100

 $(10 \times 2 = 20)$

Roll No.

3. Analyse the portal frame shown in Fig. (2) by any of matrix method and also draw the B.M.D. (20)



- 4. Analyse the pin jointed plane frame shown in Fig. (3) by using element approach of displacement method. (20)
- 5. Find the collapse load W by considering all the possible collapse mechanism and draw the collapse B.M diagram for the portal frame shown in Fig. (4). (20)



- 6. a) Explain all the conditions and theorem applicable for the plastic analysis of the structures. (10)
 - b) A beam of span L fixed at both ends carries a uniformly distributed load for a distance "a" from the left support. Find the value of the collapse load intensity. (10)

- 7. a) A T-sention consists of a flange 180×10 mm. The section modulus of the T-section is 54800mm³. This section is used as a simply supported beam of 5m span and carries a u.d.l of 32 kN/m on the whole span. Determine the shape factor of the beam and also calculate the collapse load for the beam. Assume yield stress as 250MPa. (10)
 - b) Develop the stiffness matrix for beam shown in Fig. (5) with reference to the coordinates shown in figure. End A is fixed and B is roller. Does the flexibility matrix exist or not, justify your answer? (10)





8. Design a spherical dome over a circular room for the following data : (20)
Inside diameter of room = 14m, Rise of dome = 4m,
Live load due to wind, ice, snow =1.5 kN/m².

The dome has an opening of 1.5m diameter at its crown. A lantern is provided at its top, which causes a dead load of 26 kN acting along the circumference of the opening. Use M20 and Fe 415.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.