

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- VIIth SEMESTER-EXAMINATION – MAY/JUNE- 2012

Subject code: 170605

Date: 29/05/2012

Subject Name: Advanced Structural Analysis

Time: 02:30 pm – 05:00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Draw neat & clean sketches with pencil only.

- Q.1 (a) Explain the terms: Null Matrix, Band matrix and Transpose of a matrix. 07
(b) Derive element stiffness matrix for Constant Strain Triangle element by direct approach. 07

- Q.2 (a) Write a detail on “Process of Discretization” on finite element analysis. 07
(b) Determine the shape functions for the Constant Strain Triangle. Use polynomial functions. 07

OR

- (b) Determine the shape functions for the Constant Strain Triangle. Use natural coordinate systems. 07

- Q.3 (a) Derive the expression of a stiffness matrix of a member of a grid structure with usual notations. 07
(b) Analyze the pin jointed truss for fig. 1 by stiffness matrix method using member approach. Adopt cross sectional area of all members = 1000 mm² and E = 200 kN/mm². 07

OR

- Q.3 Analyze the frame for fig.2 by stiffness matrix method using member approach. 14

- Q.4 (a) Explain detail on “Beam with Elastic supports”. 07
(b) Write a computer program on analysis of continuous beam using stiffness matrix method using C/C++. 07

OR

- Q.4 (a) Explain “Incremental analysis with Iteration” technique. 07
(b) Derive the shape functions for four noded quadrilateral elements. 07

- Q.5 A propped cantilever beam of length of 10 m fixed at one end supported by a roller at the other end carries a 20 KN point load at the centre of the span. By taking $e = 200$ GPa and $I = 24 \times 10^{-6} \text{ m}^4$. Using finite element determine: 14
1. Deflection under load
 2. SF and BM at mid span
 3. Reactions at supports

OR

- Q.5 (a) Determine the consistent nodal vector due to loads acting on the beam shown in fig. 3. 07
(b) Write short note on “Pre and Post Processors” on FEA packages. 07

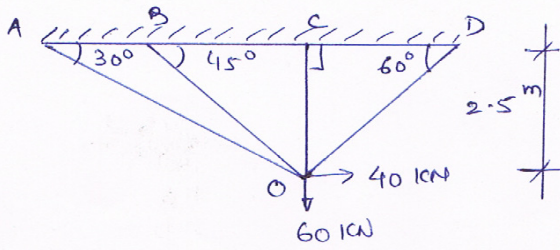


Fig. 1 (Q.3(b))

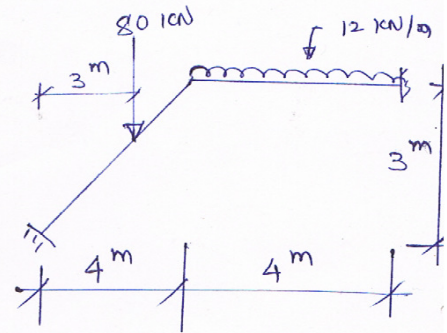


Fig. 2 (OR Q.3)

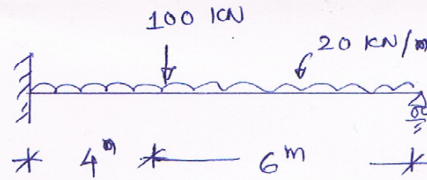


Fig. 3 (OR Q.5(a))

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