Seat No.: _____ Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – WINTER • 2014

Subject code: 1720801 **Date: 02-12-2014**

Subject Name: Finite Element Method

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.**

Q-1 (a) What is Element? Explain the selection criteria for Elements in FEM. 7

(b) Explain the different types of non-linearity encountered in FEM structural analysis. 7

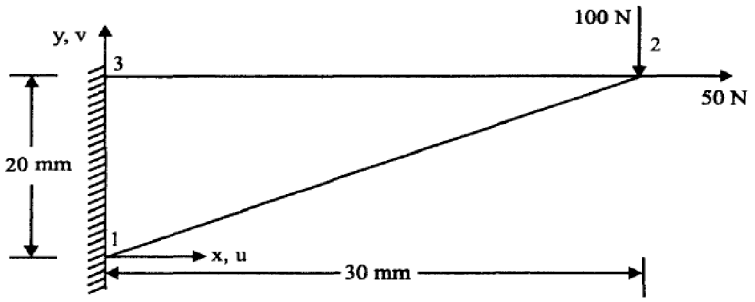
Q-2 (a) What are óEigen Valueô and óEigen Vectorô in FEM? Explain properties of Eigen vectors. 7

(b) Derive the relationship to determine the element stiffness matrix for a CST element? 7

OR

(b) Find the approximate deflection of a simply supported beam of length L under a uniformly distributed load P using the Galerkinôs method. 7

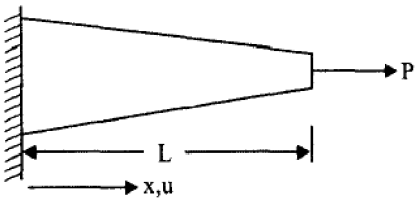
Q-3 (a) Calculate displacements and stress in a triangular plate, fixed along one edge and subjected to concentrated load at its free end. Assume E = 70,000 MPa t = 10 mm and v = 0.3. 10



(b) Differentiate between statically Equivalent Load and Consistent Load in FEM. 4

OR

Q-3 (a) Calculate the displacement at the free end of a 50cm long tapered bar of area of cross section 1000 mm^2 at its fixed end and 600 mm^2 at the free end as shown in figure, subjected to an axial tensile load of 1kN at the free end assuming 3-noded bar elements and E = 200GPa. 10



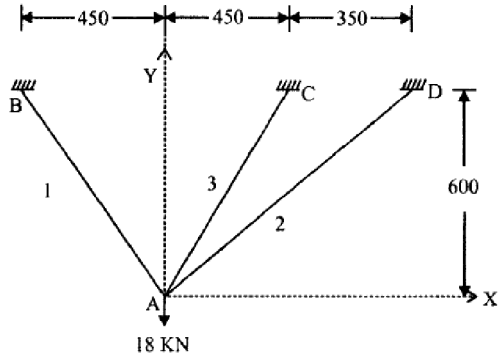
(b) Explain h, r, and p methods of mesh model optimization. 4

Q-4 (a) A concentrated load P = 50 kN is applied at the center of a both end fixed beam of length 3m, depth 200 mm and width 120 mm. Calculate the deflection and slope at the mid-point. Assume E = 2 x 10^5 N/mm^2. 10

(b) Explain Plain Stresses and Plain Strains in FEA. 4

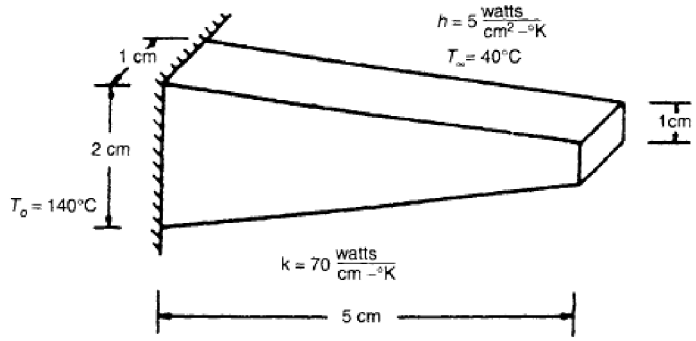
OR

Q-4 (a) For the three bar truss shown in figure below, determine the displacements of node óAô and the stresses in each elements. 10



(b) Define and explain Axi-symmetric Elements. 4

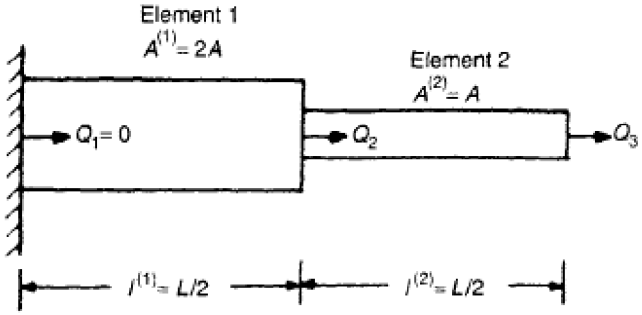
Q-5 (a) Find the temperature distribution in the tapered fin shown in figure with assumption of 2 elements. 10



(b) Briefly explain how problem involving infinite bodies are handled in finite element analysis. 4

OR

Q-5 (a) Find the natural frequencies of longitudinal vibration of the constrained stepped bar shown in Figure. 10



(b) Explain various types of Errors found in Finite Element Approximations. 4

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