10AE64

Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Finite Element Analysis

Time: 3 hrs.   Max. Marks:100

Note: *Answer FIVE full questions, selecting*
atleast TWO questions from each part.

PART – A

1   a. Explain plane stress and plane strain problems in FEA. **(10 Marks)**
    b. Using Rayleigh Ritz method find the stress and displacement at midpoint of a bar shown in Fig.Q1(b). Assume E = 70GPa; A = 100mm^2 and take displacement model to be 2nd order. **(10 Marks)**
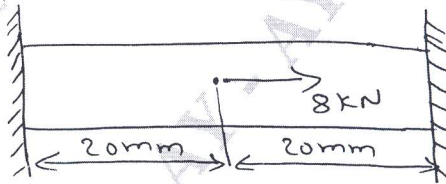

Fig.Q1(b)

2   a. Using natural co-ordinate system derive shape function of 1D bar element. **(10 Marks)**
    b. With usual notations obtain relationship between Cartesian co-ordinates and natural co-ordinates. **(04 Marks)**
    c. Explain convergence requirements to be satisfied in FEA. **(06 Marks)**

3   For the 2 bar truss shown in Fig.Q3, determine the nodal displacements, stresses in each element and reaction at support. Take E = 200GPa, Area of element = 200 mm^2 each. **(20 Marks)**
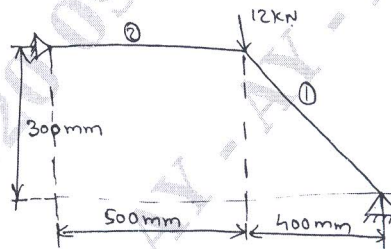

Fig.Q3

4   a. With usual notations obtain shape functions for quadrilateral element in natural coordinates. **(12 Marks)**
    b. Explain different types of higher order elements used in FEA. **(08 Marks)**

PART – B

5   a. Obtain shape function of four noded terrahedral elements. **(10 Marks)**
    b. Explain Lagrange elements and with pascal triangle. **(10 Marks)**

6   a. Explain ISOparametric, subparametric and super parametric elements. **(12 Marks)**
    b. Explain different modules of processing done in FEM analysis. **(08 Marks)**

7 a. Derive shape function for axisymmetric triangular element by cylindrical co-ordinate system. **(10 Marks)**

   b. Obtain [B] matrix for axisymmetric triangular element as shown in Fig.Q7(b) below. **(10 Marks)**
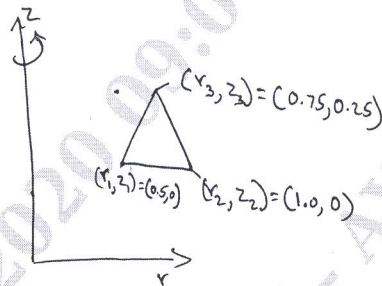

Fig.Q7(b)

8   Find the natural frequencies of stepped bar shown in Fig.Q8 considering Young's modulus as E, and density as ρ. **(20 Marks)**
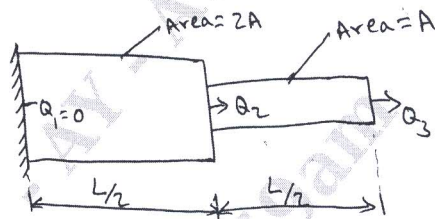

Fig.Q8

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