15

CBCS SCHEME

USN | | | | | | | | | | |

15AE651

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

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Explain phase stress and plane strain problems. **(06 Marks)**

b. For the spring system shown in Fig Q1(b) using principle of minimum potential energy determine nodal displacement. Take $F_1 = 75N$ and $F_2 = 100N$.

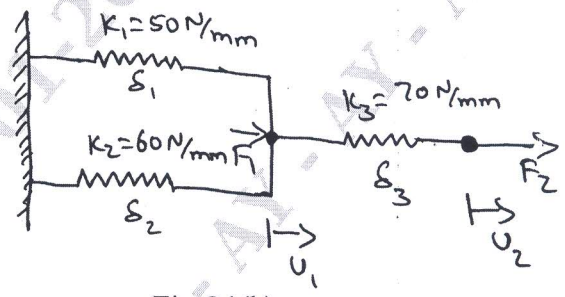

Fig Q1(b) **(10 Marks)**

OR

2 a. Explain simplex, complex and multiplex elements used in FEM. **(06 Marks)**

b. Using Rayleigh – Ritz method find stress and displacement at midpoint of bar. Shown in Fig Q 2(b) take E = 70GPa, A = 100mm^2, assume displacement model as second order polynomial.

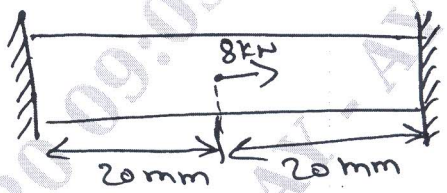

Fig Q2(b) **(10 Marks)**

Module-2

3 a. Solve for stresses in members of structure given below in Fig Q3(a).

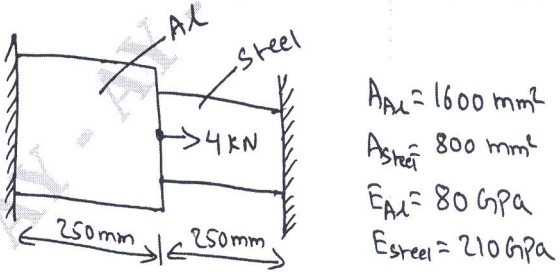

Fig Q3(a) **(08 Marks)**

b. Obtain Hermite shape function for beam element. **(08 Marks)**

OR

4 For the two bar truss, shown in Fig Q4, determine the nodal displacements. Take E = 200GPa, A = $6 \times 10^{-4} m^2$.

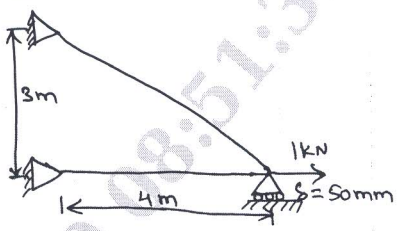

Fig Q 4 **(16 Marks)**

Module-3

5 a. Derive shape function of Triangular element in natural co-ordinate system. **(08 Marks)**

b. Derive shape function for Nine Node Rectangular element using Lagrange Formula. **(08 Marks)**

OR

6 a. Derive shape function for simple Four noded Tetrahedral element in Natural co-ordinates. **(08 Marks)**

b. Distinguish between Lagrange elements and Serendipity elements. **(08 Marks)**

Module-4

7 a. Explain Sub parametric, ISO parametric and Super Parametric elements. **(08 Marks)**

b. Explain various stages of processing in FEM. **(08 Marks)**

OR

8 a. Explain conditions for applying axisymmetric analysis. **(02 Marks)**

b. Derive shape function for a Axisymmetric triangular element. **(14 Marks)**

Module-5

9 Solve for temperature distribution in the composite wall as shown in Fig Q9. **(16 Marks)**

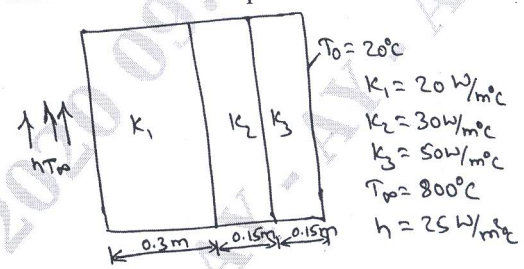

Fig Q9

OR

10 Find the natural Frequencies and corresponding mode shapes for given stepped bar with Young's modulus 'E' and density 'ρ' as shown in Fig Q10.

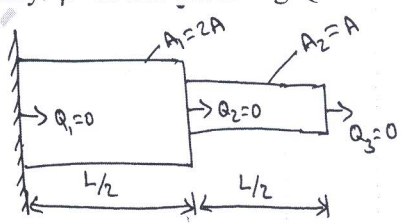

Fig Q10 **(16 Marks)**

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