CBCS SCHEME

USN

15AE651

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
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 plane stress and plane strain problem in FEM. **(06 Marks)**

b. Using principle of minimum potential energy determine nodal displacements.

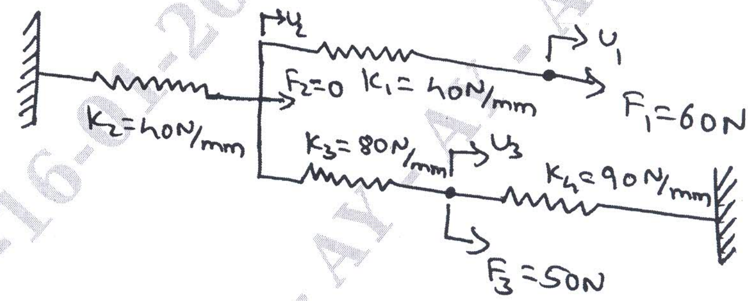

Fig Q1(a) **(10 Marks)**

OR

2 a. Use Rayleigh- Ritz method to find stress and displacement at midpoint of a bar shown in Fig Q2(a) below assuming 2nd order polynomial. Take E = 70GPA, A = 100mm^2.

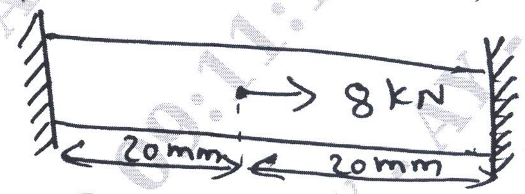

Fig Q2(a) **(10 Marks)**

b. Explain simplex, complex and multiplex elements. **(06 Marks)**

Module-2

3 a. Solve for stresses in members of structure given below :

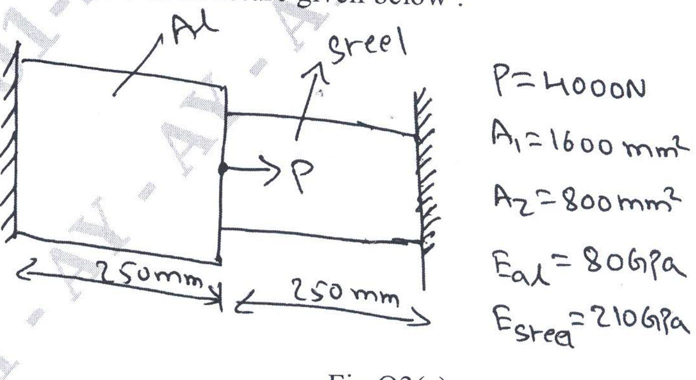

Fig Q3(a) **(10 Marks)**

b. Derive shape function for 2 noded Bar element in natural co-ordinate system. **(06 Marks)**

OR

4 Determine Nodal displacement and element stresses for given truss.

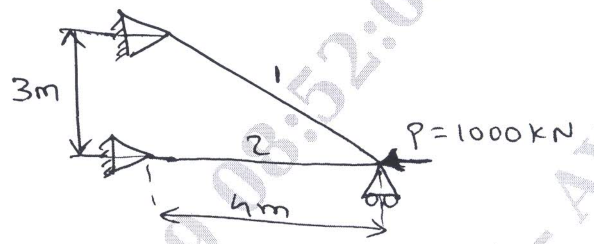

Fig Q4

Take : E = 210GPa, A = 600mm^2 **(16 Marks)**

Module-3

5 a. Using Lagrangian functions obtain shape functions for nine node rectangular element. **(10 Marks)**

b. Explain properties of shape function. **(06 Marks)**

OR

6 a. Derive shape function for constant strain triangular element. **(08 Marks)**

b. With usual notations obtain shape function for tetrahedral element. **(08 Marks)**

Module-4

7 a. Explain isoparametric, sub parametric and super parametric element. **(08 Marks)**

b. Evaluate the following integral using two point Gauss integration method

$$I = \int_{-1}^{1} (a_0 + a_1 x + a_2 x^2 + a_3 x^3 + a_4 x^4) dx$$ **(08 Marks)**

OR

8 a. Explain preprocessing and post processing. **(08 Marks)**

b. Determine the temperature distribution in a plane wall of thickness 60mm, which has an internal heat source of 0.3×10^6 W/m^3 and the thermal conductivity of material is 21W/m°C. Assume that surface temperature of the wall is 40°C use 1-D linear bar element and consider wall as axisymmetric system. **(08 Marks)**

Module-5

9 Obtain temperature distribution in composite wall as shown in Fig Q9. Using 1-D elements

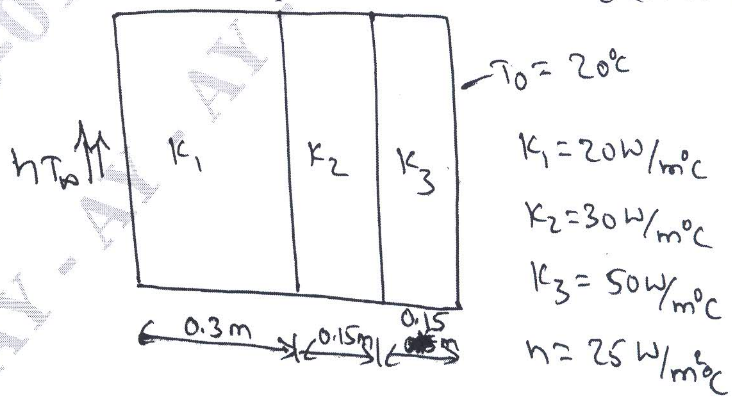

Fig Q9 **(16 Marks)**

OR

10 Find the natural frequencies of longitudinal vibration of the constrained stepped bar shown in Fig Q10 and plot mode shapes.

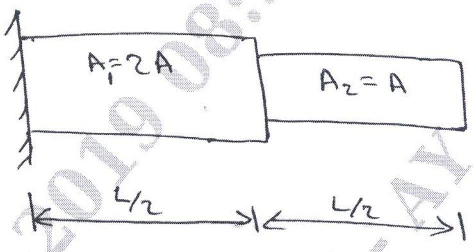

Fig Q10

Take Young's modulus = E. density = P for given material. **(16 Marks)**

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