CBCS SCHEME

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

18MEA21

Second Semester M.Tech. Degree Examination, June/July 2019
Finite Element Method

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. What is FEM? Briefly explain the steps involved in FEM. **(10 Marks)**

b. Consider the uniform bar as shown in Fig Q1(b). An axial load 'q' is linearly distributed along the length of the bar according to q = CX, where C is a constant. Using 2 term polynomial function, obtain displacement and stress by Rayleigh Ritz method. **(10 Marks)**

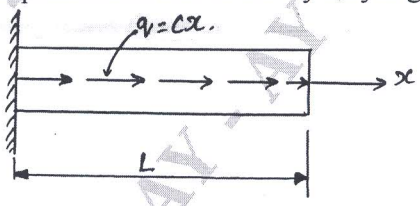

Fig Q1(b)

OR

2 a. Explain the convergence criteria's in FEM. **(06 Marks)**

b. For a simply supported beam subjected to uniformly distributed load, determine the maximum deflection using Galerikin approach. Assume $y = C_1 \sin\left[\frac{\pi x}{L}\right] + C_2 \sin\left[\frac{3\pi x}{L}\right]$

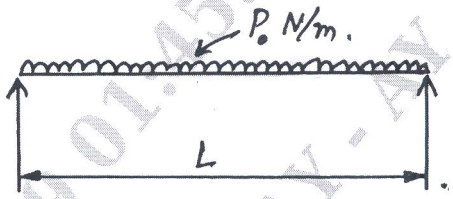

Fig Q1(b) **(14 Marks)**

Module-2

3 a. Derive the stiffness matrix of a 1-D Bar element. **(06 Marks)**

b. Consider the bar shown in Fig Q3(b). Determine the nodal displacement, element stresses and support Reactions. Take = 200GPa. **(14 Marks)**

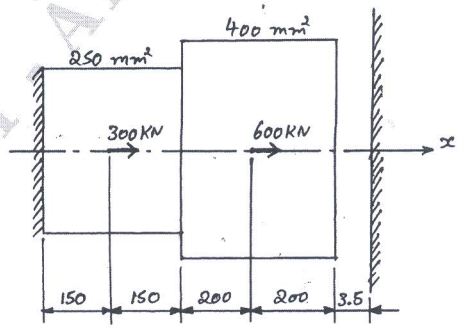

Fig Q3(b)

OR

4 a. Derive the Hermite shape function of Beam element. **(08 Marks)**

b. A 4 bar truss element is shown in Fig Q4(b). Determine :

i) Nodal displacement
ii) Stress in each element
iii) Reaction at the support
iv) Take A = 100mm^2, E = 2×10^{5}MPa

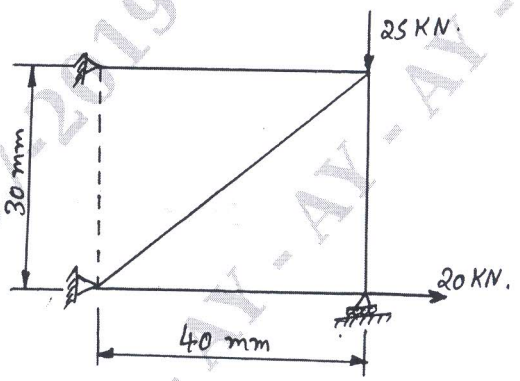

Fig Q4(b) **(12 Marks)**

Module-3

5 a. Derive the strain – displacement matrix for an axisymmetric triangular element. **(10 Marks)**

b. Derive the J^{-1} matrix for CST element. **(10 Marks)**

OR

6 a. Derive the shape function for Quadratic Quadrilateral 8 noded2-D element. **(08 Marks)**

b. Derive the shape function for HEXA8 3D element. **(12 Marks)**

Module-4

7 Write short notes on :

i) Classical thin plate theory
ii) Shear deformation theory
iii) Thick plate theory. **(20 Marks)**

OR

8 Give the detail finite element formulation of

i) Flat elements
ii) Curved elements
iii) Cylindrical elements
iv) Conical shell elements. **(20 Marks)**

Module-5

9 a. Derive the mass matrix for CST element. **(10 Marks)**

b. Derive the mass matrix for truss element. **(10 Marks)**

OR

10 Find eigen values and eigen vectors for stepped bar when it is subjected to axial vibration, with fixed free and conditions as shown in Fig Q10. **(20 Marks)**

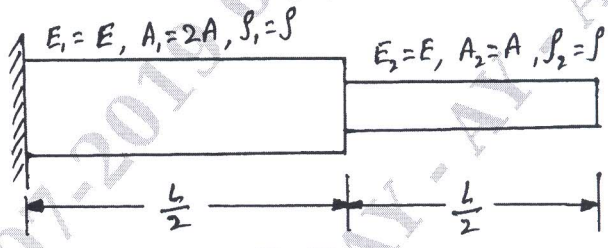

Fig Q10

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