CBCS SCHEME

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16/17MDE12

First Semester M.Tech. Degree Examination, Aug./Sept. 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 briefly the basic steps in FEM.s **(08 Marks)**

b. By R – R method, for a bar of cross section area A, elastic modulus E, subjected to unaxial load P. Show that the displacement at a distance x from the fixed end is $u = \frac{P}{AE} \cdot x$ and hence determine the end displacement and stress to which the bar subjected to. **(08 Marks)**

OR

2 a. Explain with sketches, different types of elements in FEM. **(08 Marks)**

b. Using Galerkin's method, find the expression for a cantilever beam subjected to point load P at end having I and E, length of beam L? **(08 Marks)**

Module-2

3 Solve for nodal displacements, stresses and reactions of structures as shown in Fig.Q3. Using penalty approach of handling. Boundary conditions.

E_{Al} = 80 GPa
P = 4000 N
A_1 = 1600 mm^2
A_2 = 800 mm^2
E_S = 210 GPa

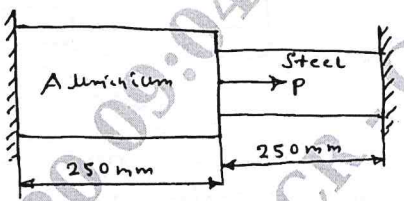

Fig.Q3 **(16 Marks)**

OR

4 For the truss shown in Fig.Q4. Determine the nodal displacements, stress in each element in reactions. Take $A_c = 200mm^2$, $E = 2 \times 10^5$ N/mm^2.

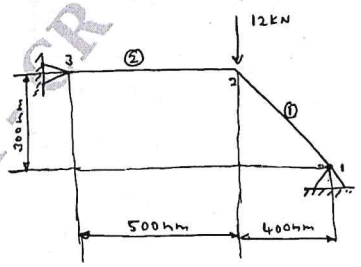

Fig.Q4 **(16 Marks)**

Module-3

5 a. Derive the shape functions for 3 – noded triangular element. **(08 Marks)**

b. Obtain shape functions for 4 – noded quadrilateral element. **(08 Marks)**

OR

6 a. Obtain shape functions for 4 – noded tetra hedral element. **(08 Marks)**

b. Obtain shape functions for HEXA – 8 element. **(08 Marks)**

Module-4

7 a. Stat assumptions made in Kiechoff's theory give stress strain relation for plate bending. **(08 Marks)**

b. Stiffness matrix C° Midlin plate is $K = \int B_m^T \; D_m \; B_m \; dA$. Give coefficients of B_m and D_m matrix. **(08 Marks)**

OR

8 a. Briefly explain classical plat theory and shear deformation theory. **(08 Marks)**

b. Describe with neat sketch the nodal degrees of freedom of any two types of plate elements. **(08 Marks)**

Module-5

9 Find the natural frequencies of longitudinal vibration of uxonstrained stepped for as shown in Fig.Q9.

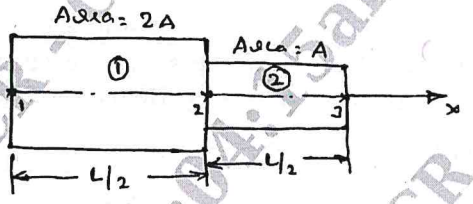

Fig.Q9 **(16 Marks)**

OR

10 For the bar shown in Fig.Q10 using consistent mass matrix find the natural frequencies of longitudinal vibration, find the corresponding mode shapes.

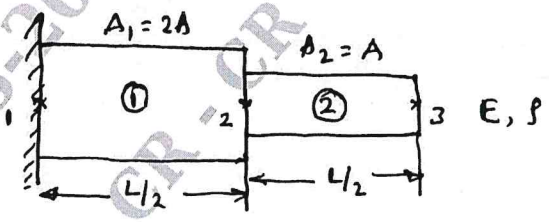

Fig.Q10 **(16 Marks)**

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