CBCS SCHEME

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18MEA21

Second Semester M.Tech. Degree Examination, Dec.2019/Jan.2020
Finite Element Method

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Determine the expression for displacement of a beam subjected to uniform distributed load P_0 over the entire length, for simply supported. **(10 Marks)**

b. Explain convergence criteria and its application. **(06 Marks)**

c. What are properties of shape functions? **(04 Marks)**

OR

2 a. Use Galerikin method to derive the expression for a Cantilever beam is subjected to point load P at its end having the moment of inertia I, young modulus E and length L. **(10 Marks)**

b. What are confirming and non confirming elements? **(06 Marks)**

c. What are properties of stiffness matrix? **(04 Marks)**

Module-2

3 a. Derive the shape functions for one dimensional beam element in natural coordinate system. **(06 Marks)**

b. Determine: (i) Nodal displacements (ii) Stress and strains (iii) Reactions at the support for the stepped bar shown in Fig.Q3(b).

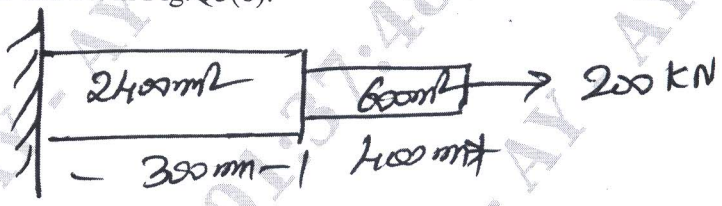

Fig.Q3(b) **(10 Marks)**

c. What are the assumptions made in truss element? **(04 Marks)**

OR

4 a. Derive the stiffness matrix to 3D truss element. **(10 Marks)**

b. For the truss shown in Fig.Q4(b), determine the displacement at nodes and stress in both the elements. Take $E = 2 \times 10^5$ N/mm^2.

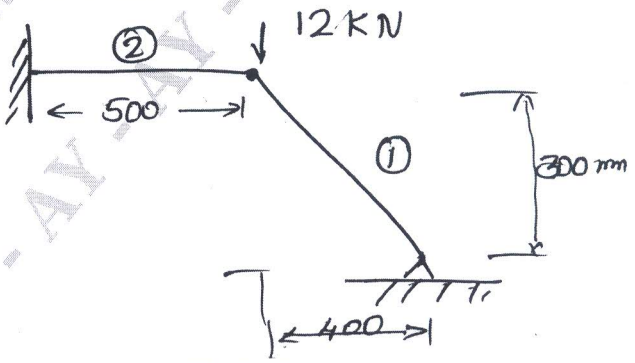

Fig.Q4(b) **(10 Marks)**

Module-3

5	a.	Derive the shape functions for four noded quadrilateral element.	(10 Marks)
	b.	Explain isoparametric subparametric and super parametric element.	(06 Marks)
	c.	What are advantages of having higher order elements?	(04 Marks)

OR

6	a.	Derive the strain matrix for triangular plane element.	(10 Marks)
	b.	Write the representation and shape functions of eight noded element.	(06 Marks)
	c.	Explain triangular Axi-Symmetric element.	(04 Marks)

Module-4

7	a.	Explain the finite element formulation for triangular plate element.	(08 Marks)
	b.	Explain classical thin plate theory for steel and plate element.	(12 Marks)

OR

8	a.	Explain the finite element formulation for cylindrical element.	(10 Marks)
	b.	Explain the finite element formulation for any structural mechanics problems.	(10 Marks)

Module-5

9	a.	Derive element mass matrix for Constant Strain Triangle (CST) element.	(10 Marks)
	b.	What are the applications of eigen values and eigen vectors? Explain in detail.	(10 Marks)

OR

10	a.	Derive the mass matrix for truss element.	(08 Marks)
	b.	What are the applications of dynamic analysis in mechanical engineering field?	(06 Marks)
	c.	Differentiate between plane frame and space frame.	(06 Marks)

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