

# CBCS SCHEME

18MEA21

## Second Semester M.Tech. Degree Examination, Aug./Sept.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. Explain the steps involved in finite element method to solve engineering problems. (07 Marks)
- b. Derive the expression for displacement if a bar subjected to uniformly distributed load  $P_0$  per unit length as shown in Fig.Q1(b). Use Galerkin method.

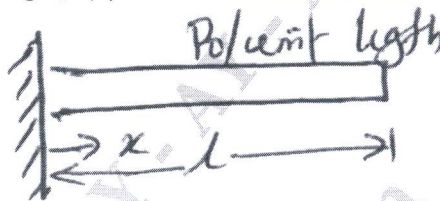


Fig.Q1(b)

- c. What are conforming and non-conforming elements? (10 Marks)

(03 Marks)

OR

- 2 a. Derive the differential equation of equilibrium for a three dimensional body. (07 Marks)
- b. Determine the displacement at nodes for a system shown in Fig.Q2(b).

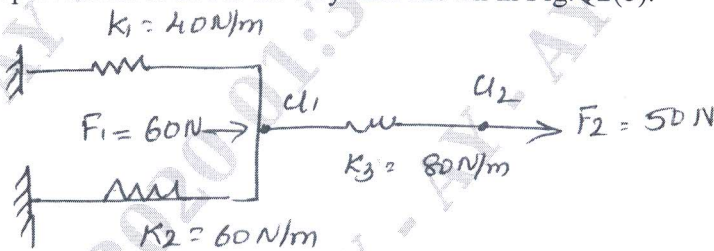


Fig.Q2(b)

- c. Explain convergence criteria requirements. (10 Marks)

(03 Marks)

### Module-2

- 3 a. Derive stress, strain and stiffness matrix for one dimensional for element. (11 Marks)
- b. What are Simplex Complex and Multiplex Elements? (09 Marks)

OR

- 4 a. Derive the stiffness matrix for 2D truss element. (10 Marks)
- b. Derive Hermits shape functions for beam element. (10 Marks)

### Module-3

- 5 a. Derive the strain matrix for 3 noded CST (Constant Strain Triangle) Element. (12 Marks)
- b. Derive the shape function for eight noded quadrilateral element. (08 Marks)

OR

- 6 a. Derive stiffness matrix for 4 noded quadrilateral element from isoperimetric representation. (12 Marks)  
b. Write short notes on: (i) Serendipity elements (ii) Lagrange elements (08 Marks)

Module-4

- 7 a. Explain classical theory and deformation theory for thin plate. (12 Marks)  
b. Explain the finite element formation for cylindrical elements. (08 Marks)

OR

- 8 a. Explain finite element formulation for quadrilateral plate element. (10 Marks)  
b. Write short notes on finite element formulation for conical and curved elements. (10 Marks)

Module-5

- 9 a. Derive the equation for mass matrix of a solid body with distributed mass. (10 Marks)  
b. What are the applications of Eigen values and Eigen vectors? (10 Marks)

OR

- 10 a. Derive the mass matrix equation for axi-symmetric triangular element. (10 Marks)  
b. (i) Explain space frames. (05 Marks)  
(ii) Draw the mode shapes for cantilever beam. (05 Marks)

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