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SIDDHARTH INSTITUTE OF ENGINEERING &amp; TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech IV Year I Semester Supplementary Examinations August-2021

FINITE ELEMENT METHODS IN CIVIL ENGINEERING

(Civil Engineering)

Time: 3 hours

Max. Marks: 60

(Answer all Five Units 5 x 12 = 60 Marks)

**UNIT-I**

- 1 a Determine the deflection at center of the simply supported beam of span length 'L' subjected to a concentrated load at its mid-point use Rayleigh-Ritz method. **10M**  
 b Explain the concept of principle of minimum potential energy. **2M**

OR

- 2 a Derive strain -displacement relationship in matrix form. **10M**  
 b Discuss merits of FEM. **2M**

**UNIT-II**

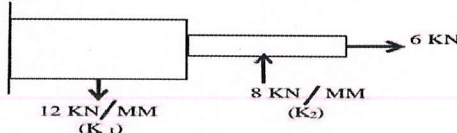
- 3 A Rod of diameter 10 mm; length 200 mm has nodal displacement due to axial loads as 1.2 mm and 2.8 mm the position of the rod is shown in figure. Calculate  
 a) Displacement at point Q on the rod b) Strain **12M**



X=60 mm X=150 mm X=260 mm

OR

- 4 a Calculate the nodal displacement and forces for the bar loaded as shown in figure. **10M**



- b Explain the Geometric invariance. **2M**

**UNIT-III**

- 5 Determine the shape functions  $N_1, N_2, N_3$  at interior point 'p' for triangular element. The co-ordinate are P(3.5,5), (2,3), (7,4) and (4,7). **12M**

OR

- 6 Derive the shape function by using matrix method. **12M**

**UNIT-IV**

- 7 Explain about plane stress and plane strain analysis. **12M**

OR

- 8 Derive strain -displacement relationship in matrix formulation. **12M**

**UNIT-V**

- 9 Explain about plane stress and plane strain conditions for the formulation of CST element. **12M**

OR

- 10 Explain about formulation of 4-noded Iso-parametric Axi - Symmetric element. **12M**

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