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**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)**

**B.Tech IV Year I Semester Regular Examinations Nov-Dec 2019
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

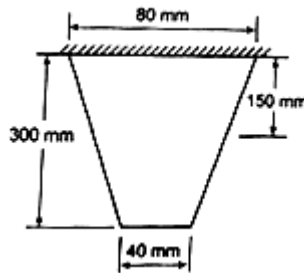
- 1 a) Explain in detail step-by-step procedure of FEM 6M
 b) List the merits and demerits of FEM 6M

OR

- 2 Derive the equations of equilibrium in case of a three-dimensional stress system. 12M

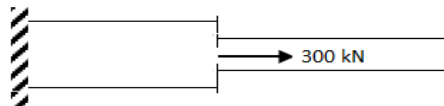
UNIT-II

- 3 For a tapered plate of uniform thickness $t = 25\text{mm}$ as shown in fig, find the displacement at the nodes by forming into two element model. The bar has weight density $\rho = 0.82 \times 10^{-4} \text{ N/mm}^3$, $E = 2 \times 10^5 \text{ MN/m}^2$. In addition to self-weight, the plate is subjected to a point load $P = 100\text{N}$ at the mid depth. Determine stress in the element and reaction force at the support. 12M



OR

- 4 For one dimensional bar element shown in the below figure, determine the stresses and reaction force. 12M



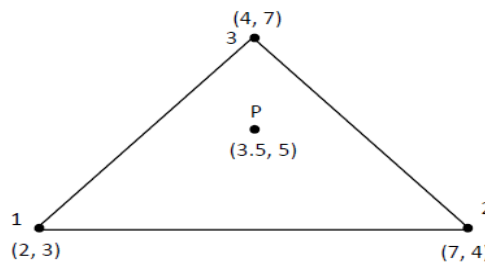
$A_1 = 2400 \text{ mm}^2$ $A_2 = 800 \text{ mm}^2$
 $E_1 = 100 \text{ GPa}$ $E_2 = 200 \text{ GPa}$
 $L_1 = 300 \text{ mm}$ $L_2 = 400 \text{ mm}$

UNIT-III

- 5 Explain in details convergent and compatibility requirements in FEM. 12M

OR

- 6 Determine the shape function N_1 , N_2 and N_3 at interior point P for the triangular element shown in figure below. 12M

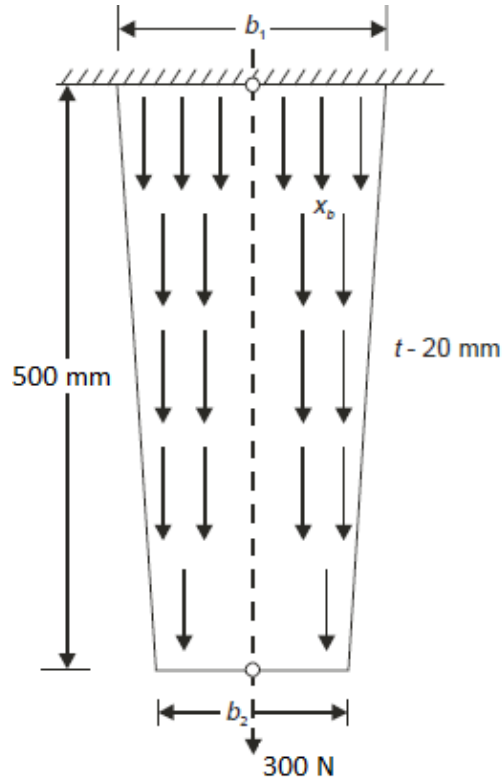


UNIT-IV

7 Explain step by step procedure for analyse 2D problem of truss. 12M

OR

8 Determine the extension of bar as shown in fig. due to self-weight and a concentrated load of 300N applied at its end. Given $b_1=125$ mm, $b_2=100$ mm, $t=20$ mm, $E=2 \times 10^5$ and $\rho=0.8 \times 10^{-4}$ N/mm² 12M



UNIT-V

9 Derive the stiffness matrix for 4-noded rectangular element. 12M

OR

10 Derive the Jacobian matrix for 4-noded Iso-parametric axi-symmetric element. 12M

*** END ***