

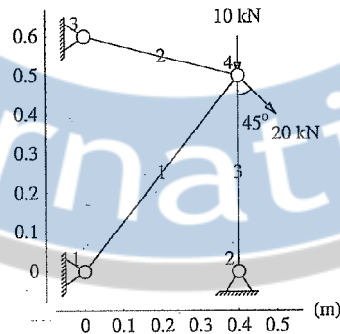
FINITE ELEMENT METHOD
(Common to SE &SD, SM&FE, GE)

Time: 3 Hours

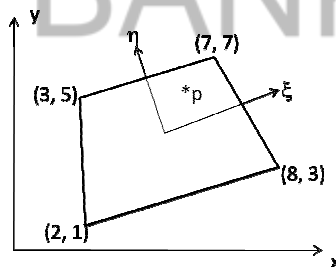
Max. Marks: 60

Answer any FIVE Questions
All Questions Carry Equal Marks

1. Using Rayleigh-Ritz method find the approximate displacement of uniform bar (EA constant) fixed at one end and subjected to a static point load at the other end. The bar is also subjected to a linearly varying axial load $q(x)=cx$, where c is a given constant. Compare the linear and quadratic solution. 12 M
2. Using minimum potential energy approach, derive the stiffness matrix and consistent load matrix 12 M
3. a Write the steps involved in FEM for a structural mechanics problems solution with formulations 6M
b Write the concept of FEM with example. Explain the Software's based on FEM. 6M
4. Find the nodal displacement and member forces for the truss shown in figure 12 M

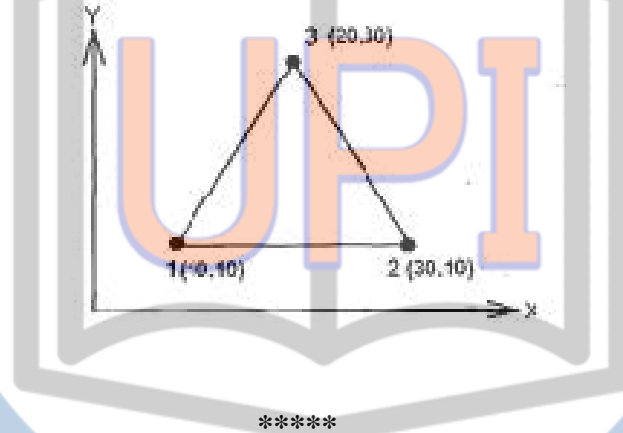


5. a Define with neat sketch, Iso-parametric, Super-parametric and Sub-parametric elements 6M
b Determine the Cartesian coordinates of the point $P(\xi=0.7, \eta=0.6)$ shown in figure 6M



Code No: H8701/R13

6. A propped cantilever beam of length 10 m carries a concentrated load of 20kN at the centre of span. $EI=48 \times 10^5 \text{N-m}^2$. Determine deflection under the load and shear force and bending moment at mid span. 12 M
7. Derive the shape function for three noded CST element and draw the variation of shape functions. 12 M
8. A plate of dimensions 15cm x 6cm x 1cm is subjected to an axial pull of 15kN. Assuming a typical element is of dimensions as shown in figure. Find shape functions at point (15, 20). Determine the strain displacement matrix and constitutive matrix. $E=200\text{GPa}$, $\mu=0.3$ 12 M



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