Code No: J8701/R16

M. Tech. II Semester Regular Examinations, May-2017

FINITE ELEMENT METHOD

(Common to Structural Engineering (87) and Computer Aided Structural Engineering (35))

Time: 3 Hours **Max. Marks: 60**

Answer any FIVE Questions
All Questions Carry Equal Marks

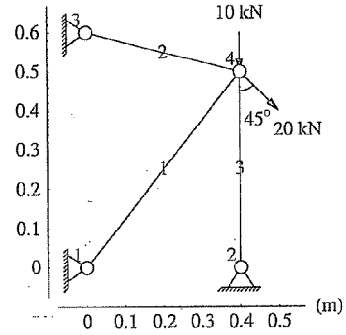
---

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

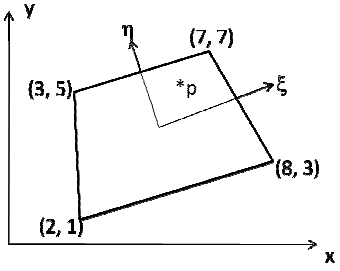
2. Using minimum potential energy approach, derive the stiffness matrix and consistent load matrix 12 M

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(ξ=0.7, η=0.6) shown in figure 6M

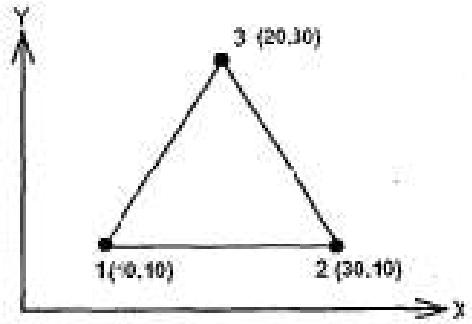


Code No: J8701/R16

6. A propped cantilever beam of length 10 m carries a concentrated load of 20kN at the centre of span. EI=48x10^{5}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=200GPa, μ=0.3 12 M



*****