Subject Code: H2103/R13

M. Tech –II Semester Regular/ Supply Examinations, October, 2015

FINITE ELEMENT METHOD

(Common to TE, MD, MED, CAD/CAM, AMS and AM&MSD)

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

Answer any FIVE questions

All questions carry EQUAL marks

****

1. Construct the weak form and the quadratic potential if it exists for the following problem

Longitudinal deformation of a bar with an end spring:

$$-\frac{d}{dx}\left(a\frac{du}{dx}\right)=q \quad \text{for } 0<x<L$$

$$u(0)=0, \qquad \left(a\frac{du}{dx}+ku\right)\Big|_{x=L}=P$$

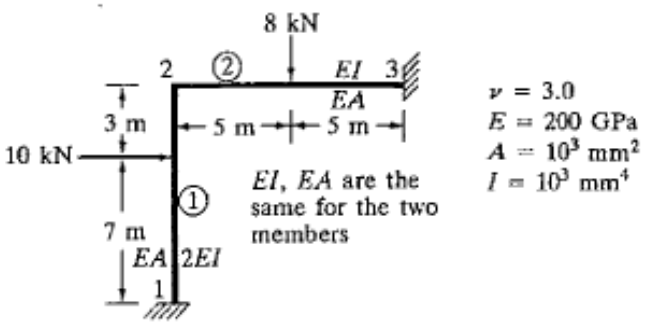
where a and q are functions of x, and k and P are constants.

2. Compute the coefficient matrix and the right-hand side of the N-parameter Rayleigh-Ritz approximation of the equation $-\frac{d}{dx}\left[(1+x)\frac{du}{dx}\right]=0 \ \textit{for}\ 0<x<1$

$$u(0)=0,\ u(1)=1$$

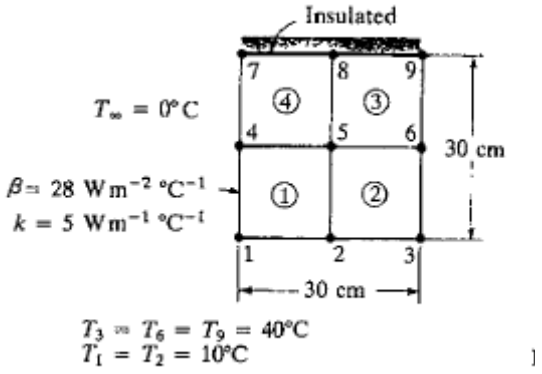
Use algebraic polynomials for the approximation functions, Specialize your result for N=2 and compute the Ritz coefficients

3. For the problem shown
   (a) Give the transformed element matrices
   (b) Assembled element matrices
   (c) The condensed matrix equations for the unknown generalized displacements and forces.



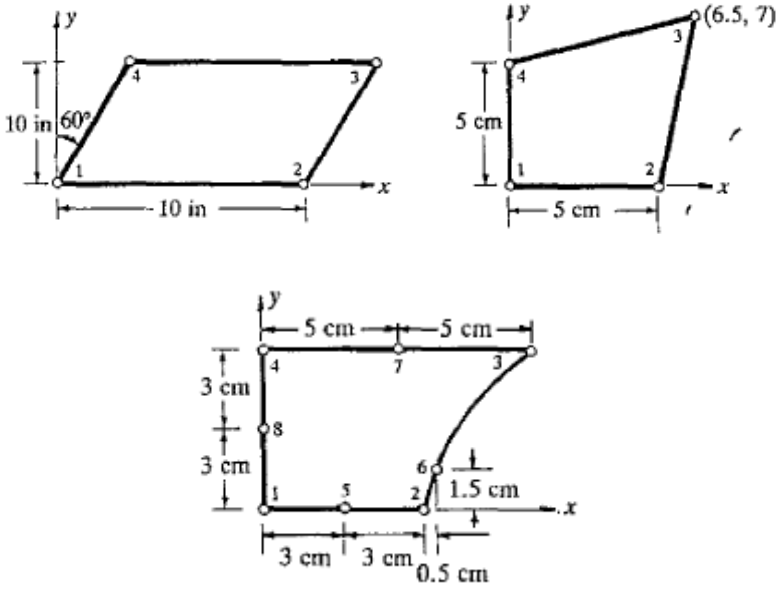
Subject Code: H2103/R13

4. Write the finite element equations for the unknown temperatures of the following problem



5. Determine the smallest natural frequency of a beam with damped ends, and o constant cross-sectional area A, moment of inertia I, and length L, Use the symmetry and two Euler – Bernoulli beam elements in the half-beam

6. Determine the jacobian and the transformation equations for the following



7. The transverse displacement of a triangular bending element (w) is expressed as a complete third degree polynomial in x and y. The nodal degrees of freedom are the displacements and the partial derivatives. Determine whether the convergence requirements are satisfied by this model.

8. a) Discuss in detail serendipity and Lagrange interpolation functions
   b) Explain how boundary conditions are handled in FEM
   c) Derive the characteristic matrix for two dimensional fin

****

|"|'"||"||'"||||