Subject Code: H2103/R13

M. Tech –II Semester Regular Examinations, September, 2014

FINITE ELEMENT METHOD

(Common to TE, MD, ME, CAD/CAM and AMS)

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

Answer any FIVE questions

All questions carry EQUAL marks

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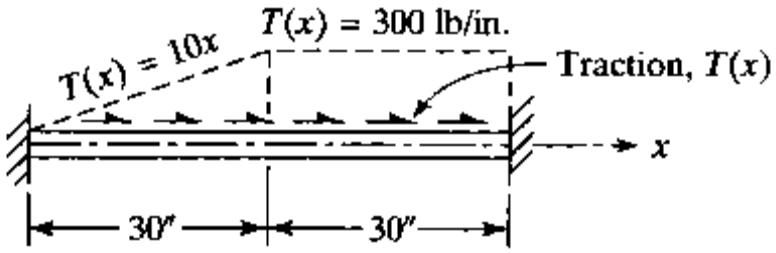
1. A steel rod is attached to rigid walls at each end and is subjected to a distributed load T(x) as shown in figure.



$E = 30 \times 10^6$ psi $A = 2$ in.^{2}

(a) Write the expression for the potential energy .

(b) Determine the displacement u(x) using the Rayleigh Ritz method. Assume a displacement field $u(x) = a_0 + a_1 x + a_2 x^2$. Plot u verses x.

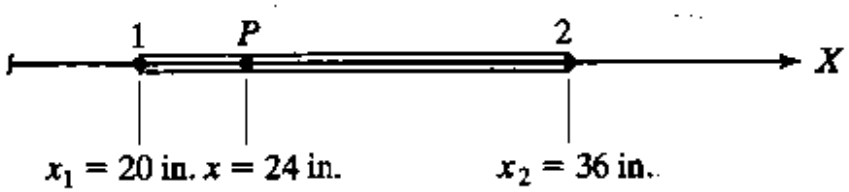
(c) Plot σ versus x

2. (a) Write the comparison of Finite element method with other methods.

(b) Evaluate the following:

(i) Evaluate ξ, N_1 and N_2 at the point P.

(ii) If q_1=0.003 in and q_2=-0.005 in, determine the value of the displacement q at point P.



3. (a) Write the properties of element stiffness matrix.

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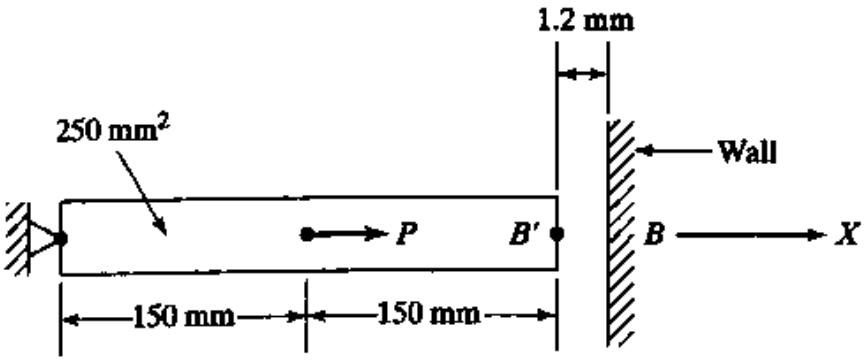
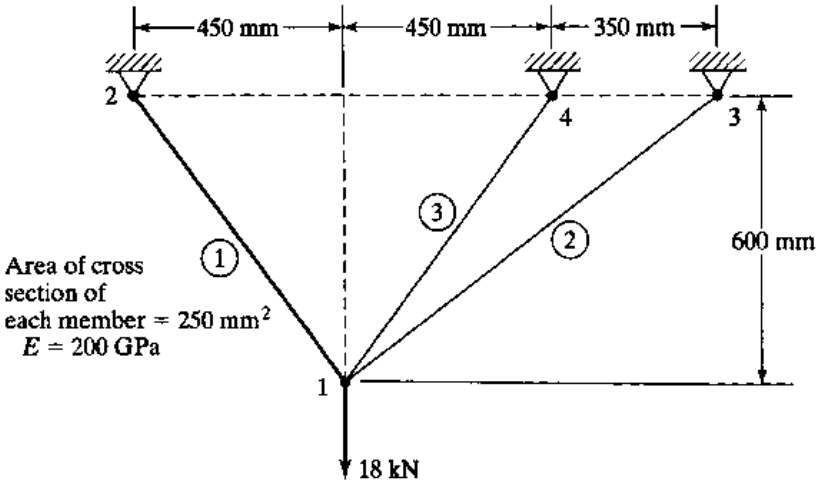
(b) In figure, a load P=60×10^3 N is applied as shown. Determine the displacement field, stress and support reactions in the body. Take E=20×10^3 N/mm^2.

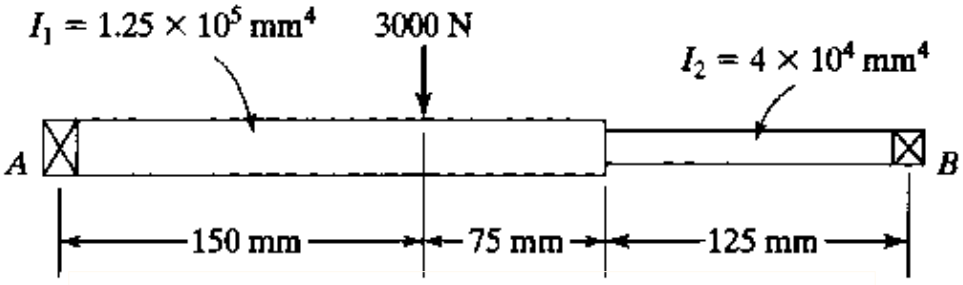


4. For the three bar truss shown in figure, determine the displacements of node 1 and the stress in element 3.



5. (a) Explain Hermite shape functions in detail.

(b) Find the deflection at the load and the slopes at the ends for the steel shaft shown in figure. Consider the shaft to be simply supported at bearings A and B.



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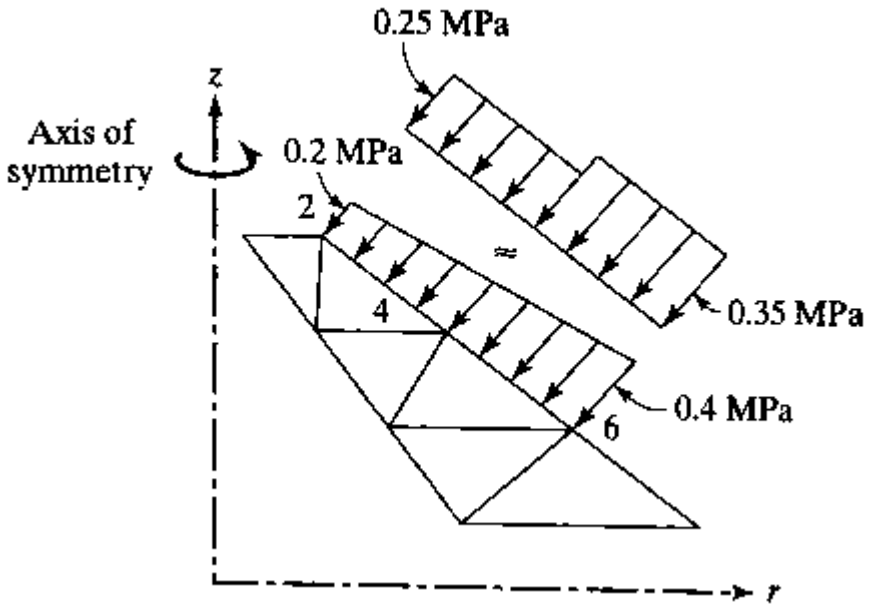
6. (a) An Axisymmetric body with a linearly distributed load on the conical surface is shown in figure. Determine the equivalent point loads at nodes 2, 4 and 6.



(b)Write a short note on Constant strain triangle (CST).

7. Write a short note on the following:
   (a) Patch test
   (b) Sub parametric elements
   (c) H-refinement

8. Explain the Eigen value evaluation methods in detail.

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