

Code No: **R31031**

R10

Set No. 1

III B.Tech I Semester Supplementary Examinations, May - 2017

FINITE ELEMENT METHODS

(Common to Mechanical Engineering and Automobile Engineering)

Time: 3 hours

Max. Marks: 75

Answer any FIVE Questions

All Questions carry equal marks

- 1 a) Write the stress- strain relationship for the both plane stress and plane strain problems. [7M]
b) Differentiate between Plain strain and Plane stress conditions with examples. [8M]
- 2 Consider the bar as shown in fig.1. Determine the nodal displacements, element stresses and support reactions. Solve this problem by hand calculation, adopting the elimination method for handling boundary conditions. [15M]

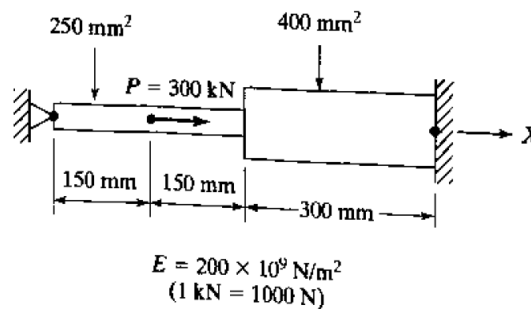


Fig.1

- 3 Taking advantage of symmetry, determine joint displacements and axial forces in the three bar truss shown in fig.2. All members have the same cross sectional area and are of the same material, $A = 0.001 \text{ m}^2$ and $E = 200 \text{ GPa}$. The load $P = 20 \text{ kN}$. The dimensions in meters are shown in the figure. [15M]

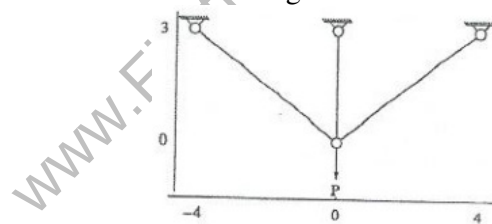


Fig.2

- 4 Determine the maximum deflection in the uniform cross section of cantilever beam shown in figure.3 by assuming the beam as a single element. [15M]



Fig.3

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- 5 An axisymmetric body with a linearly distributed load on the conical surface is shown in fig.4 Determine the equivalent point loads at nodes 2,4, and 6. [15M]

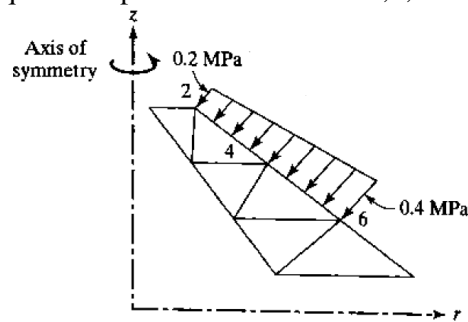


Fig.4

- 6 a) Evaluate the following Gaussian quadrature [7M]

$$I = \int_1^3 dx/x \text{ by 3-point formula.}$$

- b) Write a note on isoparametric elements. [8M]

- 7 A brick wall of thickness $L = 30$ cm, $K = 0.7$ W/m⁰C, has a temperature of 28⁰ at inner surface and outer surface is exposed to cold air at -15⁰C as shown in fig.5 Determine the steady state temperature distribution within the wall. Use two element model assume one dimensional heat flow. [15M]

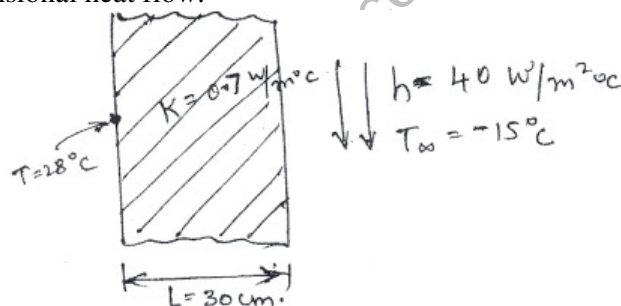
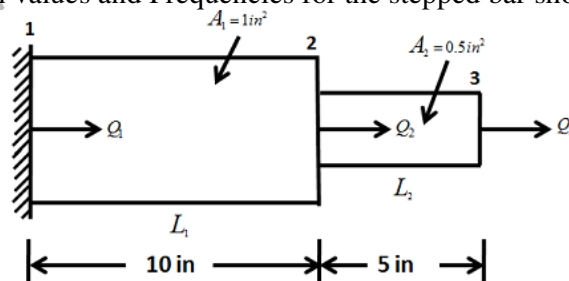


Fig.5

- 8 Determine the Eigen values and Frequencies for the stepped bar shown in Fig.6 [15M]



$$E = 30 \times 10^6 \text{ psi}$$

$$\text{Specific weight } f = \frac{0.283 \text{ lb}}{\text{in}^3}$$

Fig.6
