

Code No: H2103/R13

M. Tech. II Semester Regular/ Supplementary Examinations, July-2016

FINITE ELEMENT METHOD

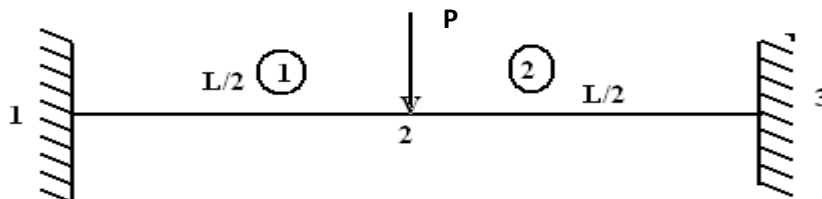
(Common to TE, MD, MED, CAD/CAM, AMS and AM&MSD)

Time: 3 Hours

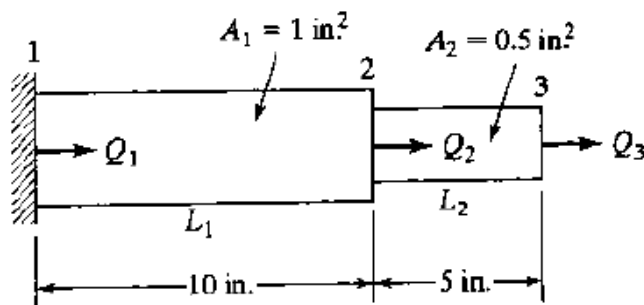
Max. Marks: 60

*Answer any FIVE Questions
All Questions Carry Equal Marks*

1. a What do you mean by essential and natural boundary conditions? 4
b Explain the principle of minimum potential energy method with an example. 4+4
2. Analyze beam shown in the figure by using FEM 12



3. a How do you evaluate the shape functions for the Lagrange elements? 6
b Find the shape functions of cuboid or brick with 8 nodal points with the help of Lagrange formulae. 6
4. a How convergence criterion is classified? Explain each of them and when the elements are called conformal elements. 3+3+3
b What is monotonic convergence? 3
5. Determine the eigen values and eigenvectors for the stepped bar shown in the figure below. 12



$E = 30 \times 10^6$ psi
Specific weight $f = 0.283$ lb/in.³



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6. a Explain the inverse Iteration method. 8
b List out the properties of Eigen vectors? 4
7. a What are the two types of expressions in a weak form? Explain how to find the quadratic functional. 6
b Obtain the variational form and also compute quadratic functional for 6
- $$-\frac{d}{dx} \left[a \frac{du}{dx} \right] - cu + x^2 = 0 \text{ for } 0 < x < 1$$
- $$u(0) = 0, \left| a \frac{du}{dx} \right|_{x=1} = 1$$
8. A composite wall consists of three materials as shown in the figure. The outer temperature is $T_0 = 20^\circ\text{C}$. Convection heat transfer takes place on the inner surface of the wall with $T_{\text{inf}} = 800^\circ\text{C}$ and $h = 25\text{W/m}^2\text{C}$. Determine the temperature distribution in the wall. 12

