Enroll. No. _____

END SEMESTER EXAMINATION: FEBRUARY - 2021

MAE404 **FINITE ELEMENT METHODS**

[ET]

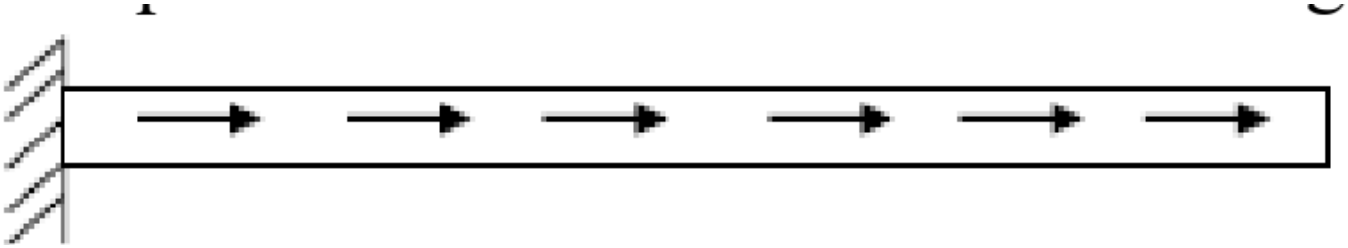
Time: 2 ½ Hrs. Max Marks: 70

Note: Attempt questions from all sections as directed.

Section: A- Attempt all questions. Each question caries 14 marks. **[42 Marks]**

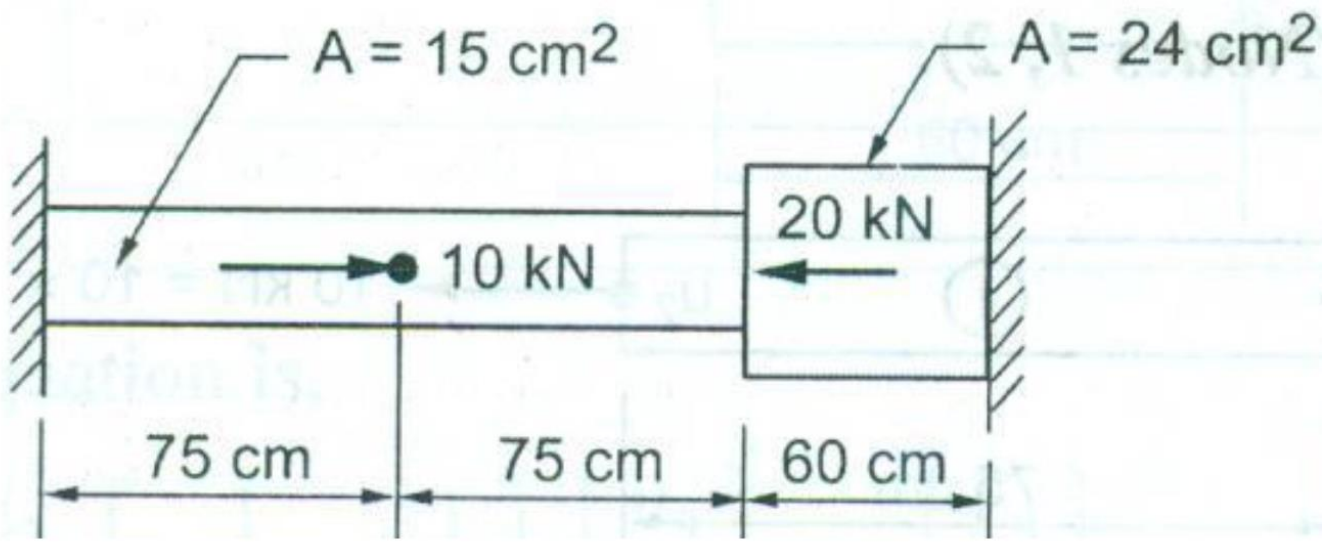
Q.1 (a) Solve the differential equation for a physical problem expressed as $d^2y/ dx^2 + 50 = 0$, $0 \leq x \leq 1$ with boundary conditions as y (0) = 0 and y (10) = 0, Trial function $y = a_1x (10-x)$; by all weighted residual methods

(b) Consider a uniform rod subjected to a uniform axial load as illustrated in Figure. Calculate the displacement and stress in the bar using Raleigh Ritz method and Compare with exact solutions.



Q.2 (a) Derive the shape functions of 2D Beam element.

(b) Determine the nodal displacements, element stresses and support reactions for the bar loaded as shown in the figure.



Q.3 Determine the nodal displacements, element stresses and support reactions for the bar loaded as shown in the figure.

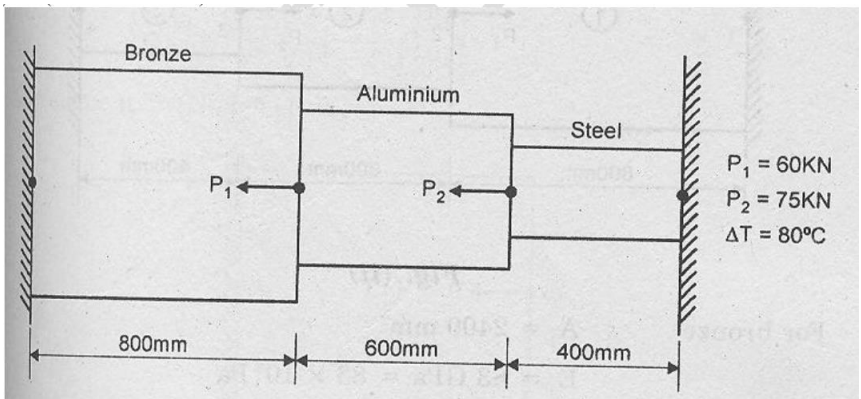


Fig. (i)

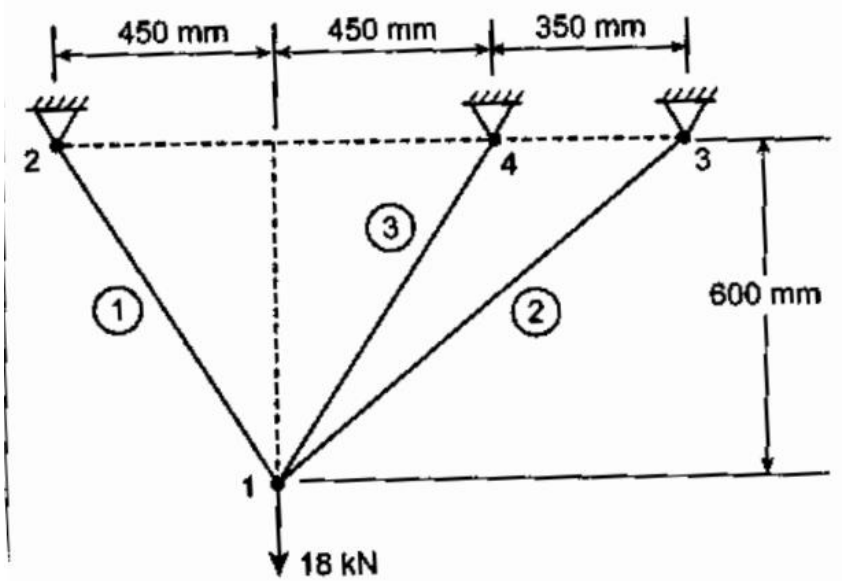
Bronze	Aluminium	Steel
A = 2400 mm²	1200 mm²	600 mm²
E = 83 GPa	70 GPa	200 GPa
$\alpha = 18.9 \times 10^{-6}/°C$	$23 \times 10^{-6}/°C$	$11.7 \times 10^{-6}/°C$

Section – B*: *Attempt all questions. Each question carries 14 marks. **[28 Marks]**

Q4 (a) Specify the shape functions of four node quadrilateral element

(b) What are the characteristics of shape functions?

Q.5 For the three-bar truss shown in figure. Determine the displacements of node 1 and the stress in element 3. A = 250 mm^2 E = 200 GPa



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