Seat No. | | | | | | |

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मठ - 062

Finite Element Analysis & Simulation (New)
(1280)

P. Pages : 4

Time : Four Hours **Max. Marks : 100**

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory and solve **any two** bits out of a, b & c from each unit.
5. Assume suitable data, if necessary.
6. Use of non-programmable calculator is allowed.

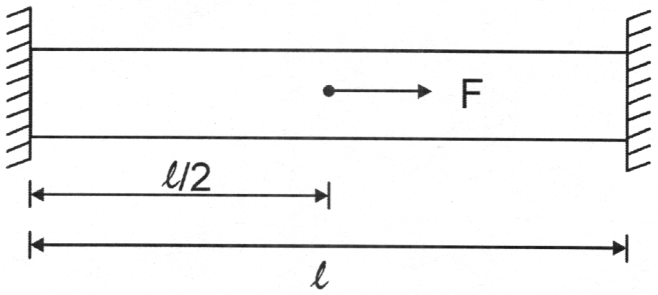
UNIT - I

1. a) A fixed beam of $10mm^2$ cross sectional area and 200mm length as shown in figure is subjected to an axial force of 2000N at midpoint, using the Rayleigh Ritz approximation. **10**
Determine -

i) the displacement function

ii) the strain function

iii) the stress function.



b) Explain "Finite Element Analysis as an Integral part of Computer Aided Design." **10**

c) Explain in details the steps of Finite Element Analysis. **10**

UNIT - II

2. a) Define the following terms : **10**

i) Global Coordinate System.

ii) Local Coordinate System.

iii) Natural Coordinate System.

iv) Shape Function.

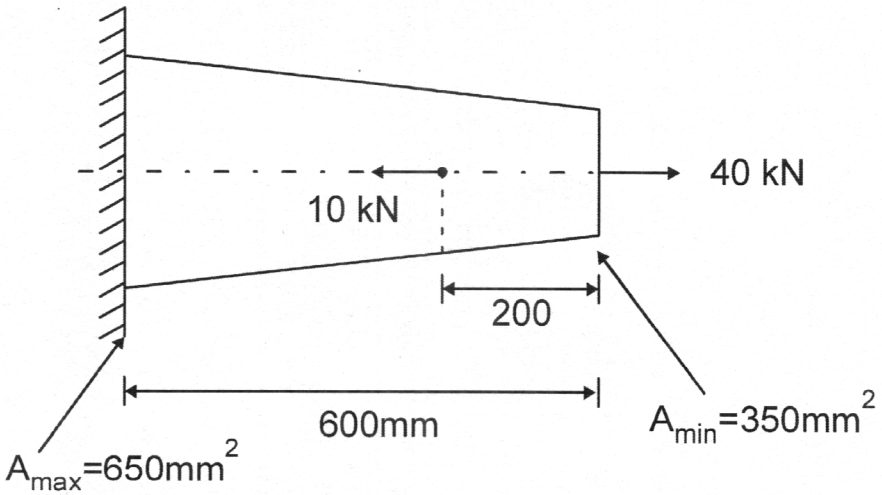
v) Body Force (F_B)

b) A steel tapered bar of 600mm length has the cross sectional areas of $650mm^2$ and $350mm^2$ at two ends. It is fixed at large end and subjected to two axial forces of 40KN and 10KN as shown in figure. The modulus of elasticity for the bar material is $200 \times 10^3 \, N/mm^2$. model the bar with three finite elements and determine -

i) the nodal displacements

ii) the stresses in each element and

iii) the reaction force at the supports. **10**

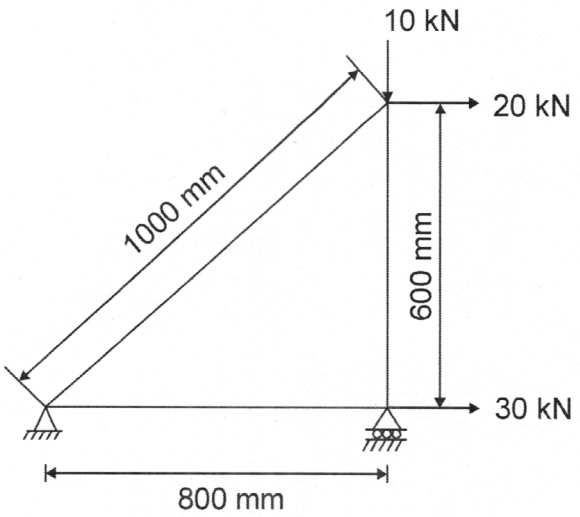


c) The three bar truss made of steel $\left(E = 200 \times 10^3\ N/mm^2\right)$ is subjected to horizontal forces 30KN and 20KN and the vertical force of 10KN as shown in figure. The cross sectional area is $300mm^2$ for each element, using the finite element method, determine -

i) the nodal displacements.

ii) the stresses in each element.

iii) the reaction forces at the supports. **10**



UNIT - III

3. a)

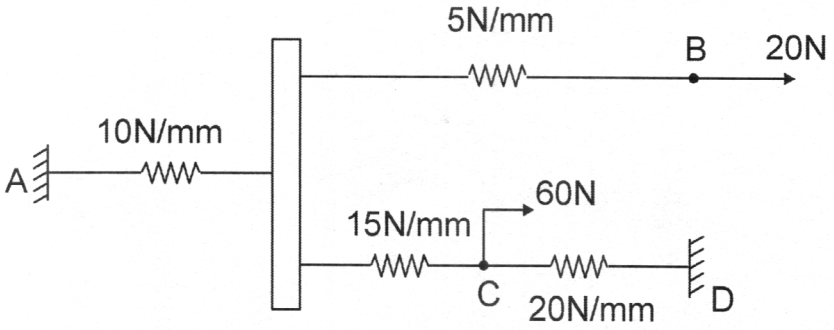


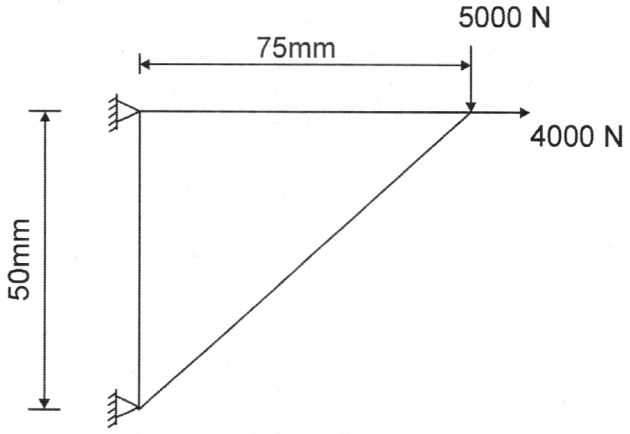
Figure shows a cluster of four springs. The assembly is fixed at the points A and D while the forces of 20N and 60N are applied at points B and C respectively. Using the finite element method. determine -

i) the deflection of each spring.

ii) the reaction force at supports. **10**

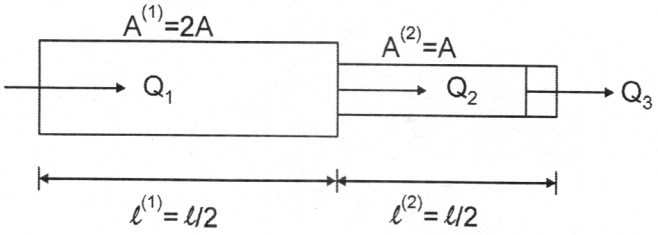
b) Explain mesh generation and impositioning in finite Element Analysis. **10**

c) A triangular plate of size $75mm \times 50mm \times 12.5mm$ is subjected to inplane loads of 5000N and 4000N as shown in figure. The modulus of elasticity and poisson's ratio for plate material are $200 \times 10^3 \, N/mm^2$ and 0.25 respectively. Model the plate with CST element. determine
i) the element stiffness matrix.
ii) the nodal displacements
iii) the reaction force at the supports
iv) stresses in element. **10**



UNIT - IV

4. a) Find the natural frequencies of longitudinal vibration of the unconstrained stepped bar as shown in figure. **10**



b) Write a short note on torsion of prismatic shaft. **10**

c) What is flow of ideal fluids ? Explain in details. **10**

UNIT - V

5. a) Explain in details Monte Carlo method. **10**

b) Describe the principle used in modeling. **10**

c) Explain exponential growth model. **10**

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