4109

Finite Element Analysis & Simulation
(New) (1280)

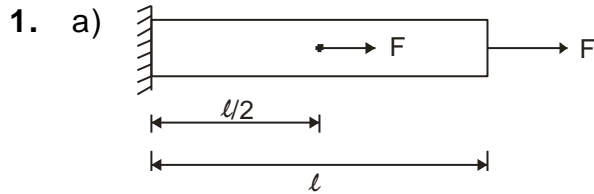**P. Pages : 3**

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

Instructions to Candidates :
1. Do not write anything on question paper except Seat No.
2. Answer sheet 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 units are compulsory and solve **any two** sub questions out a, b & c from each unit.
5. Assume suitable data if necessary.
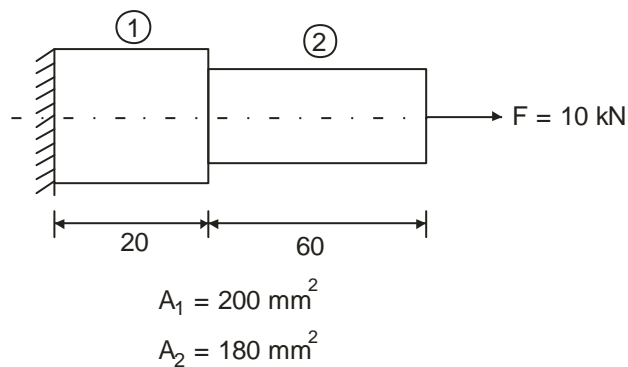6. Use of non - programmable calculator is allowed.

UNIT - I

10

1. a)

A steel rod of 20mm diameter and 30mm length as shown in figure is subjected to two equal forces of magnitude of 20 kN at the midpoint and end. The modulus of elasticity for steel is 207000 N/mm^2. Using the Rayleigh - Ritz method determine :
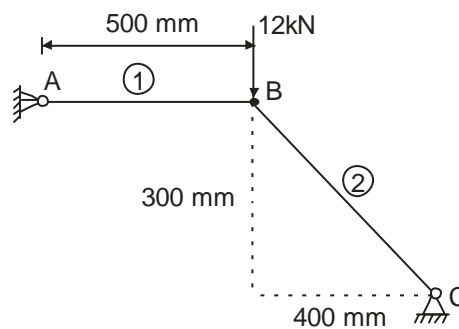i)   The approximate displacement function
ii) The approximate strain function
iii) The approximate stress function

b) Explain the different types of elements used in FEA along with   **10**
sketch, degree of freedom per node, no. of nodes and applications.

c) Write short notes on :   **10**
i)   Discretization process in FEA
ii) Equilibrium method.

UNIT - II

2. a) List out the software used in FEM ? Explain in details preprocessing, processing & post processing. **10**

   b) A stepped bar is made of two materials joined together as shown in figure. The bar is subjected to an axial pull of 10 kN. Determine the displacements & stresses of each of the section using a ID spar element **10**

   $(E_1 = 200GPa, E_2 = 120GPa, A_1 = 200mm^2, A_2 = 180\,mm^2)$

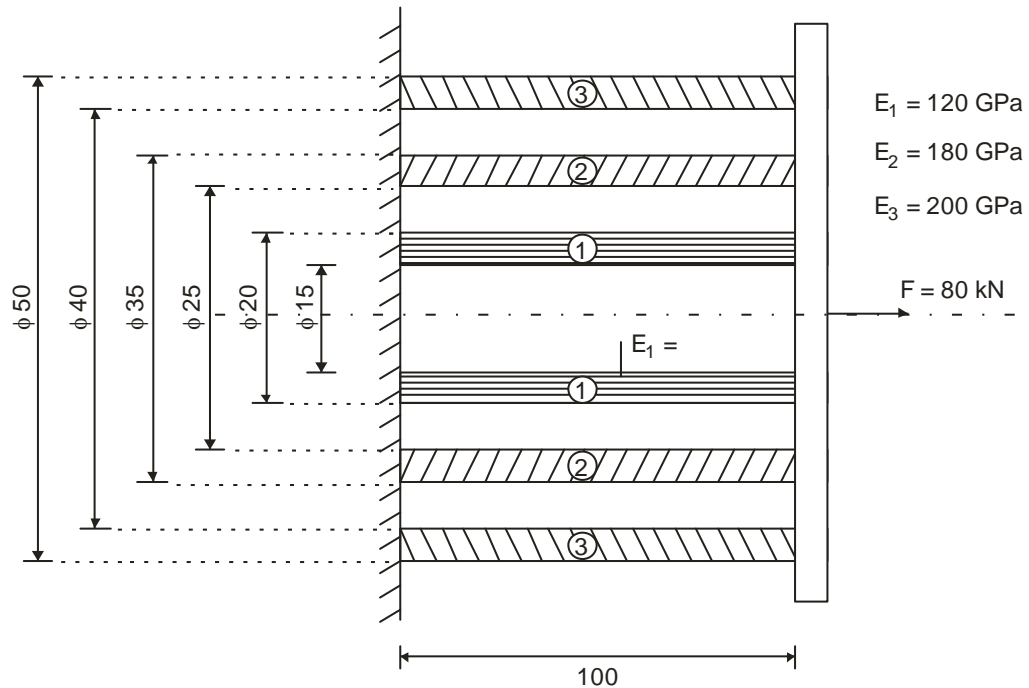$$20 \quad\quad 60$$

$$A_1 = 200\ mm^2$$

$$A_2 = 180\ mm^2$$

   c) For the two bar truss as shown in figure. Determine the displacements and the stresses in the bar. Assume **10**

   $E = 70GPA$ and $A = 200\,mm^2$ for both members.

UNIT - III

3. a) The concentric rings of different materials are joined together as shown in figure. Determine the displacement at the free ends.

b) Explain mesh generation and imposition for finite element analysis. **10**

c) Derive an expression for stream function in two dimensional flow. **10**

UNIT - IV

4. a) Explain in details forsion of prismatic shafts. **10**

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

c) Explain in details motion of fluid in flexible container. **10**

UNIT - V

5. a) What is simulation ? Explain the steps of simulation process ? What are the application of simulation ? **10**

b) Explain Monte Carlo Simulation with diagram. **10**

c) Define the terms. **10**
   i)   System
   ii) System environment
   iii) Entity
   iv) Attributes
   v)   Activity along with example.

****