Seat No.

OCT-NOV 2025 WINTER EXAMINATION

1154 B.Tech. CBCS

Sub. Name: Finite Element Analysis

Sub. Code: 67503/83714/83949

Day and Date: Friday ,05-12-2025 **Total Marks: 70**

Time: 02:30 PM To 05:00 PM

Instructions:
1. **All questions are compulsory**
2. **Draw neat labelled diagrams wherever necessary**
3. **Figures to the right indicate full marks**
4. **Use of Scientific calculator is allowed**

Q1) **Attempt any two from the following:** **[12]**

a) Discuss the advantages and disadvantages of Finite element method over Classical and Experimental method.

b) Discuss the general steps of finite element analysis.

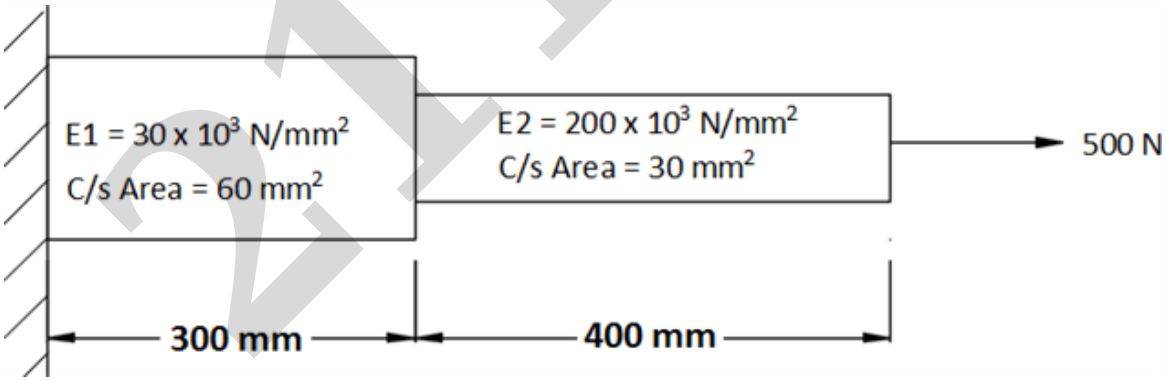
c) How can an FEA problem be simplified through symmetry? Explain with proper sketches.

Q2) a) Explain briefly one dimensional elements used in FEA **[12]**

OR

a) Derive an expression of Stiffness Matrix of 1D Linear element.

b)Refer the figure and determine Nodal displacements

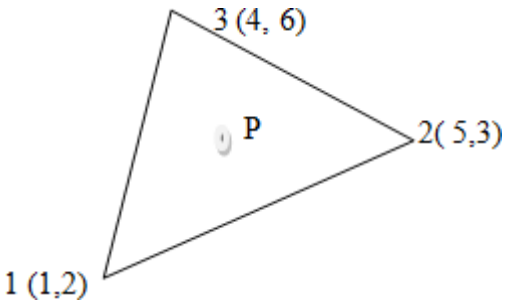


Q3) a) List down and briefly explain the elements for two dimensional elements used in FEA **[12]**

OR

a) Explain Constant Strain Triangle

b) The nodal co-ordinates of a triangular element are as shown in fig. The 'x' co-ordinate of interior point P is 3.3 and shape function N1 = 0.3. Determine N2, N3 and 'Y' co-ordinates of P.



Q4) a) Discuss displacement functions for axisymmetric element **[10]**

OR

a) Give the applications of axisymmetric elements with suitable examples.

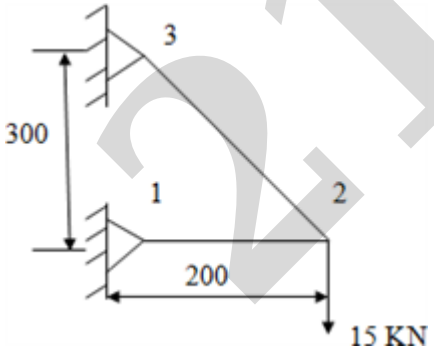
b) A long cylinder of 80 mm internal diameter and 120 mm external diameter snugly fits in a hole over its full length. The cylinder is then subjected to an internal pressure of 2 MPa. Draw the sketch showing actual problem and also model the problem for a sample length of 10 mm using two axisymmetric triangular elements with proper forces and boundary conditions. Also show the element connectivity table and coordinates of all nodes.

Q5) a) Write down and explain the expression for Stiffness matrix of truss element **[12]**

OR

a) Discuss the general steps involved in the analysis of truss.

b) The cross sectional area of each member of truss is 150 mm^2. Modulus of elasticity, E =200 GPa for each element. Determine the deflections in each of the member. Lengths are in mm.



Q6) a) Derive an expression for stiffness matrix of 1D fin **[12]**

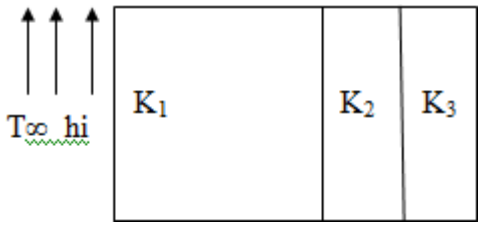
OR

a) Explain and discuss two dimensional heat transfers with help of triangular element

b) A composite wall consisting of three materials as shown in figure. The outer temperature is 40 °C. Convection heat transfer takes place on the inner surface of the wall with T∞ = 500 °C and h = 25 W/ M^2 °C. Determine the temperature distribution in the wall.

K1 = 20 W/ M °C, K2 = 30 W/ M °C, K3 = 50 W/ M °C, To = 40 °C,

L1 = 0.3 m, L2 = 0.1 m, L3 = 0.1 m



End Of Question Paper

Important Note for Chief Exam Officer / SRPD Coordinator / Sr Supervisor/ Student -
This Question Paper may be distributed for following Subjects as common code.
सदरची प्रश्नपत्रिका खालील विषयांकरिता वितरित करता येईल.

1] (101) Bachelor of Engineering (83949) Finite Element Analysis Part 4 SEM 7
2] (101) Bachelor of Engineering (67503) Finite Element Analysis Part 4 SEM 7
3] (1154) B.Tech. CBCS (83714) Finite Element Analysis Part 4 SEM 7