MASTER OF TECHNOLOGY (MECHANICAL CAD/CAM) (CBCS - 2015 COURSE)

M. Tech. (Mechanical CAD/CAM) Sem-II :SUMMER- 2022

SUBJECT : ADVANCED FINITE ELEMENT METHOD

Day : Tuesday
Date : 26-07-2022

S-14202-2022

Time : 10:00 AM-01:00 PM
Max. Marks : 60

N.B.

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Answers to both the sections should be written in **SEPARATE** answer book.
4) Use of non – programmable **CALCULATOR** is allowed.

SECTION – I

Q.1 What is significance of shape function in FEM? Find shape function for linear 1D element at node 1 and node 2. **(10)**

OR

Write a note on following steps of FEM

1. Discretization of continuum
2. Selection of displacement model
3. Computation of element stress, strain and nodal displacement

Q.2 a) Define different types of 1D, 2D and 3D elements with neat sketches. **(05)**

b) Explain elimination approach for finding out unknowns in FEM **(05)**

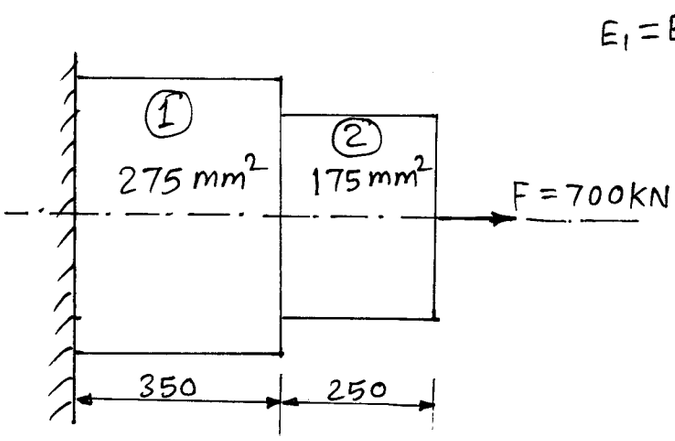
OR

Derive and explain element stiffness matrix with potential energy approach.

Q.3 With the help of case study explain what is meant by plain stress and how it is used for conversion of 3D problem in 2D problem. Also define how stress and deflection are calculated in FEM. **(10)**

OR

Stepped metallic bar with circular cross section 275 mm^2 and 175 mm^2 having length of 350 mm and 250 mm respectively. Modulus of elasticity 200 GPa. If boundary condition applied as shown in figure one end fixed and axial tensile force of 700 KN applied on free end.



Calculate 1) Nodal displacement using element stiffness matrix
2) Elemental stresses 3) support reactions

PTO

SECTION - II

Q.4 Explain 1) Constant Strain Triangular (CST) element **(10)**
2) Linear Strain Triangular (LST) element

OR

Explain Kirchoff's plate theory.

Q.5 Explain dynamic response analysis using direct integration method. **(10)**

OR

Explain multiple degrees of freedom system.

Q.6 Write note on adaptive finite element technique. **(10)**

OR

Write note on sub modelling and sub structuring.

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