M. Tech.-II (Mechanical CAD/CAM) (CBCS – 2015 Course) :
SUMMER - 2019
SUBJECT : ADVANCED FINITE ELEMENT METHOD

Day : Monday
Date : 03/06/2019

Time : 11.00 AM TO 02.00 PM
Max. Marks : 60

S-2019-3413

N.B.

1) All questions are **COMPULSORY**.
2) Figures to the **RIGHT** indicate **FULL** marks.
3) Answer to both the sections should be written in **SAME** Answer book.
4) Use of non-programmable calculator is **ALLOWED**.
5) Assume suitable data if necessary.

SECTION – I

Q.1 Explain with neat sketches the difference between p and h refinements in finite element method. **(10)**

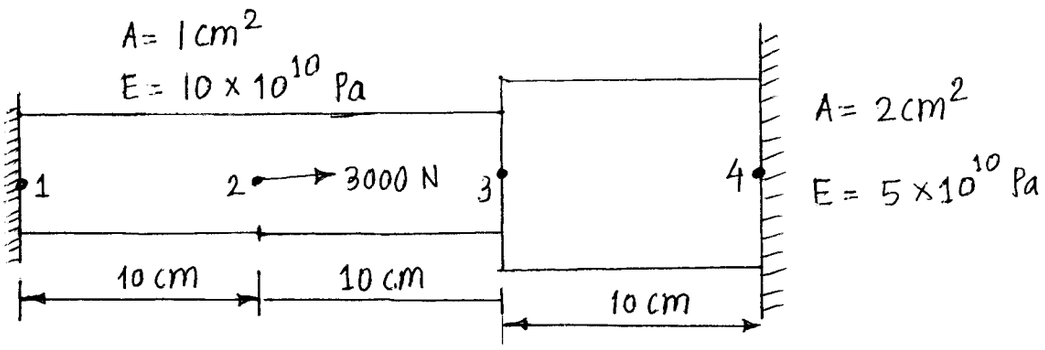
OR

List five typical areas of mechanical engineering where the finite element method is applied and explain with examples.

Q.2 Derive elemental stiffness matrix for two noded bar element using potential energy approach. **(10)**

OR

Fig. Shown below has three bar assemblage. Determine the assembled global stiffness matrix, displacement at nodes 2 & 3 and reactions at node 1 & 4.



Q.3 Explain formulation of elemental stiffness matrix and load vector for constant strain triangles (CST). **(10)**

OR

A triangular element has nodal coordinates (10,10) (40,20) and (30,50) for nodes 1,2 and 3 respectively. For a point 'P' inside triangle, determine the x and y coordinates if shape function N_1 and N_2 are 0.15 and 0.25 respectively.

.. P.T.O.

SECTION – II

Q.4 Explain with sketch the concept of axi-symmetry problems in solid mechanics. **(10)**

OR

If nodes 1, 2, 3 and 4 are located at the coordinate points (3,3) (6,3) (6,5) and (3,5) and temperature distribution has been computed at each nodes as $T_1 = 120^0C$, $T_2 = 65^0C$, $T_3 = 40^0C$ and $T_4 = 80^0C$. Derive shape function and compute temperature at x = 4 and y = 4.

Q.5 Derive the consistent mass matrix for bar element and beam element. **(10)**

OR

Find eigen values and eigen vector of $A = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$.

Q.6 Explain the steps required to carry-out linear buckling analysis. **(10)**

OR

Explain adaptive finite element technique.

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