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17AU73

Seventh Semester B.E. Degree Examination, July/August 2021
Finite Element Modelling and Analysis

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions.*

1 a. Define FEM. Write the limitations and appellations of FEM. **(10 Marks)**

b. For the spring system shown in Fig.Q1(b) using principle of minimum potential energy determine the Nodel displacement take $F_1 = 75N$, $F_2 = 100N$.

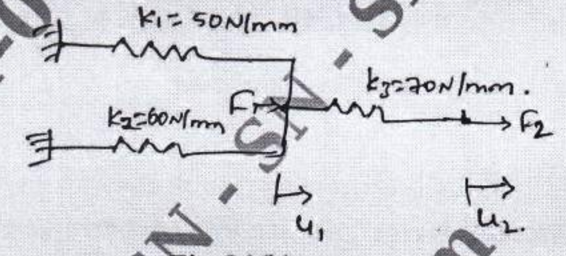

Fig.Q1(b) **(10 Marks)**

2 a. Derive the equilibrium equation for 3D elastic body. **(10 Marks)**

b. Solve the following system of simultaneous equation by gauss elimination method.

$x + y + z = 9$
$x - 2y + 3z = 8$
$2x + y - z = 3.$ **(10 Marks)**

3 a. What is shape function? Derive shape function for bar element in global co-ordinate system. **(10 Marks)**

b. Explain basic steps involved in FEM. **(06 Marks)**

c. Write the properties of stiffness matrix. **(04 Marks)**

4 a. What are the convergence requirements? Discuss three conditions of convergence requirements. **(10 Marks)**

b. Write short notes on :
i) Number of elements
ii) Location of Nodes
iii) Pascal's Triangle. **(10 Marks)**

5 Consider the bar shown in Fig.Q5. An axial load $P = 60 \times 10^3 N$ is applied at its mid point. Using elimination method and penalty method determine nodal displacement.

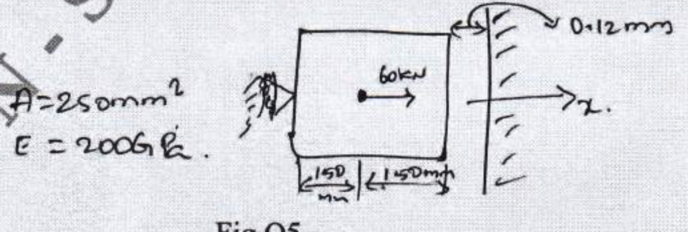

Fig.Q5 **(20 Marks)**

6 For the 2 bar truss shown in Fig.Q6, determine nodal displacement and stress in each member. Also find support reaction. E = 200 Gpa.

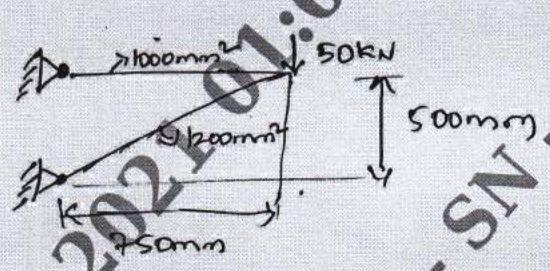

Fig.Q6

(20 Marks)

7 Derive Hermite shape function for beam element. Sketch the variation. **(20 Marks)**

8 a. Write shape function for 2D triangular element by using natural co-ordinates. **(10 Marks)**

b. Write shape function of 2D quadrilated element by using natural co-ordinates. **(10 Marks)**

9 For beam element shown in Fig.Q9, determine deflection (vertical and slop) also find deflection at centre of the portion of bema carrying UDL.

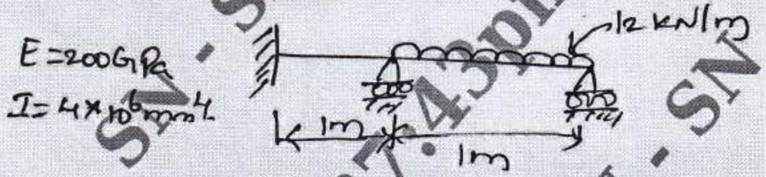

Fig.Q9

(20 Marks)

10 Solve for temperature distribution in composite wall, using 1D heat element using penalty approach method.

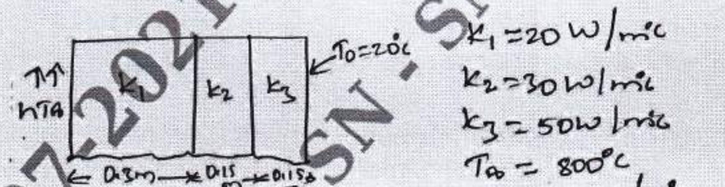

Fig.Q10

(20 Marks)

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