R19

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech II Semester Examinations, July/August - 2021
ADVANCED FINITE ELEMENT AND BOUNDARY ELEMENT METHODS
(CAD/CAM)

Time: 3 Hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks
- - -

1. Determine the nodal displacements, stress in each material and reaction forces for the bar shown in the figure 1. $P = 200 \times 10^3$ N. [15]

Aluminum
$A_1 = 2400$ mm^2
$E_1 = 70 \times 10^9$ N/m^2

Steel
$A_2 = 600$ mm^2
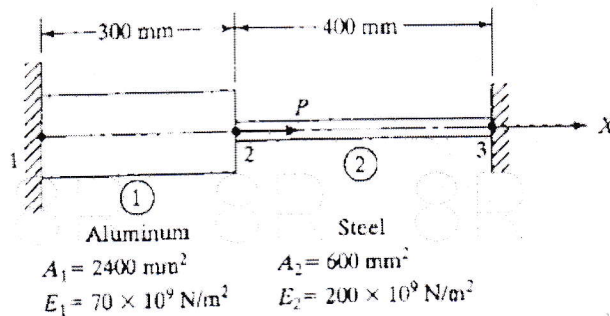$E_2 = 200 \times 10^9$ N/m^2

Figure 1

2. Calculate the stiffness matrix for plane stress condition for CST whose coordinates are 1(10,10), 2(50,15) and 3(35,55) mm and is made of steel with the young's modules 210 Gpa and Poison's ratio 0.3. Take t = 5 mm. [15]

3.a) Formulate the mass matrix for a uniform bar element using lumped mass method.
  b) Derive the thermal force vector for a 2D heat transfer element. [8+7]

4. What is the difference between linear and non linear finite element methods? What are the conditions for non linearity? [15]

5. Explain the steps involved in solving a simple problem in boundary element method. [15]

6. For the beam and loading shown in figure 2 determine: (a) slope at 2 and 3 (b) vertical deflection at midpoint of the load Take E=200GPa, I= 4×10^6 mm^4. [7+8]

$E = 200$ GPa
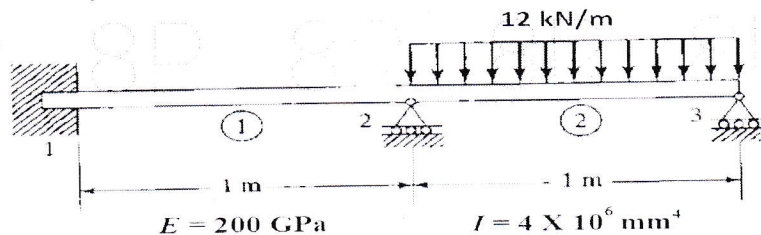
$I = 4 \times 10^6$ mm^4

Figure 2

7.a)   What are the advantages and limitations of Boundary element method?
  b)   Write short notes on Mindlin beam and explain the procedure for solution.   [7+8]

8.a)   Discuss the Isoparametric, subparametric and super parametric elements.
  b)   Determine the Eigen values and Eigen Vectors for the stepped bar as shown in figure 3.   [7+8]
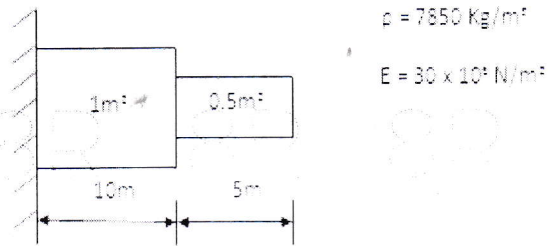
$\rho = 7850 \ Kg/m^3$

$E = 30 \times 10^4 \ N/m^2$

1m² 0.5m²

10m 5m

Figure 3

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