Hall Ticket Number :										

R-14

Code: 4G573

IV B.Tech. I Semester Supplementary Examinations August 2020

Finite Element Methods

(Civil Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Describe the procedure involved in finite element method? 7M

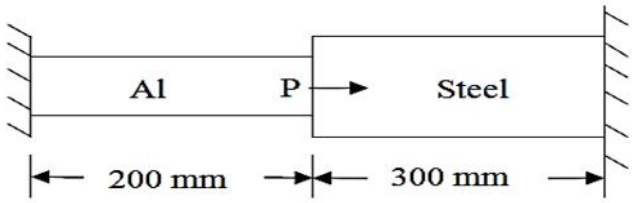
   b) If the displacement field is described as follows,

   $u = \left(-x^2 + 2y^2 + 6xy\right)10^{-4}$ *and* $v = \left(3x + 6y - y^2\right)10^{-4}$,

   Determine the strain components (direct and shear) at the point x=1, y=0. 7M

OR

2. An axial load of $4X10^5$ N is applied at 30^0 C to the rod as shown in figure. The temperature is then raised to 60^0C. Calculate nodal displacements, stresses in each element and reactions at each node.

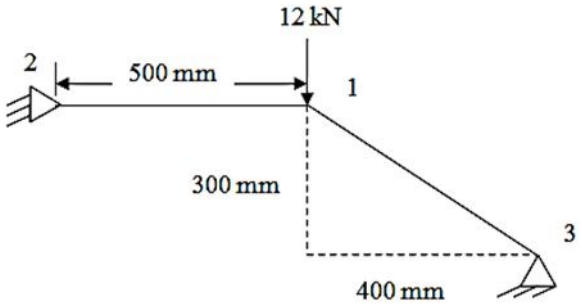


	Aluminum	Steel
A	1000 mm^2	1500 mm^2
E	0.7 X 10^5 N/mm^2	2 X 10^5 N/mm^2
~	23 X $10^{-6}/^0C$	12 X $10^{-6}/^0C$

14M

UNIT–II

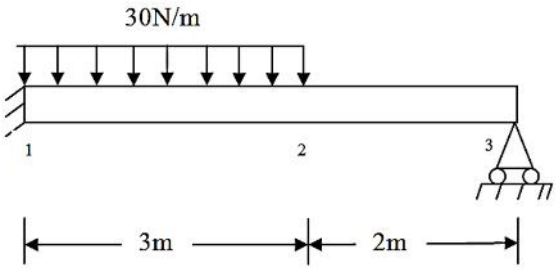
3. For the two bar truss shown in figure, determine the displacement at node 1 and the stress in element 1-3. Take E=70 GPa, A=200 mm^2.



14M

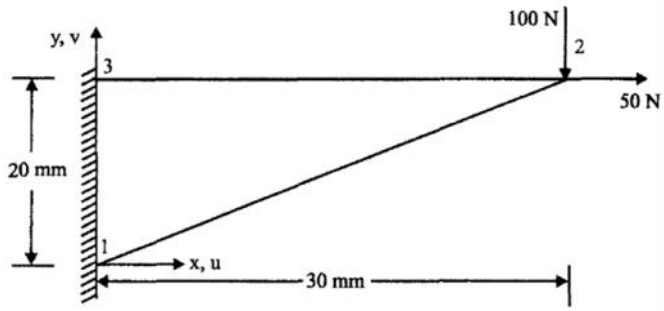
OR

4. For the loaded beam shown in figure, determine the slope and deflection at node 2 using finite element concept. Take EI=900 Nm^2. 14M



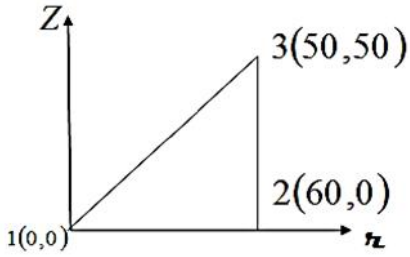
UNIT–III

5. Calculate displacements and stress in a triangular plate, fixed along one edge and subjected to concentrated load at its free end. Assume E = 70,000 MPa, t=10mm and υ = 0.3. 14M



OR

6. Determine stiffness matrix for given axi-symmetric element. E=200GPa, ^{3} =0.25. Coordinates are in millimeters. 14M



UNIT–IV

7. a) Define i) Isoparametric element ii) Subparametric element iii) Super parametric element. 4M

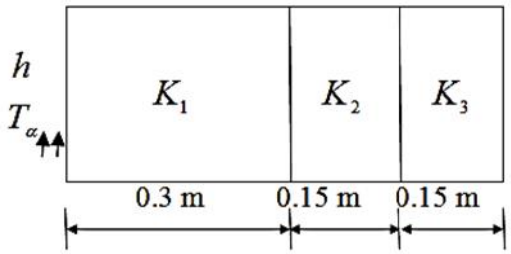
   b) Evaluate following using Gaussian quadrature. Also compare with exact solutions.

   i. $\int_{-1}^{1}(x^4-3x+7)\,dx$ ii. $\int_{-1}^{1}e^{-x}\,dx$

   iii. $\int_{-1}^{1}\left[x^2+\cos(x/2)\right]dx$ iv. $\int_{-1}^{1}\frac{\cos x}{1-x^2}\,dx$ 10M

OR

8. A composite wall consists of 3 materials. The outer surface temperature is 20°C. Convective heat transfer takes place on the inner surface of the wall with surrounding temperature T_α= 800°C, and h=25W/m²K. Determine the temperature distribution in the wall.

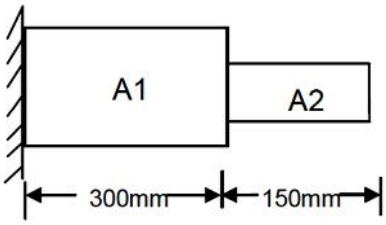


$K_1 = 20\ W/mK$
$K_2 = 30\ W/mK$
$K_3 = 50\ W/mK$
$h = 25\ W/m^2K$
$T_\alpha = 800\ ^0C$

14M

UNIT–V

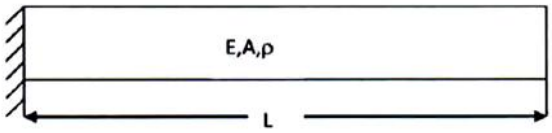
9. Evaluate Eigen vectors and Eigen values for the stepped bar shown in figure. Take E= 200 GPa and specific weight 7850 kg/m³ . Draw mode shapes. Take A_1=300 mm² and A_2= 150mm².



14M

OR

10. Evaluate the lowest Eigen value and the corresponding Eigen modes for the beam shown in figure. E=200 GPa and ° =7840kg/m3, I=2000 mm4, A=240 mm2, L=300mm.



14M

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