Reg. No.															

Question Paper Code	12680

M.E. / M.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2024

Second Semester

M.E. - CAD / CAM

20PCDPC202 - ADVANCED FINITE ELEMENT ANALYSIS

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	List the various weighted residual methods.	2	K1	CO1
2.	Compare the Ritz technique with the nodal approximation method.	2	K2	CO1
3.	Define two-dimensional scalar variable problem.	2	K1	CO2
4.	Compare CST and LST elements.	2	K2	CO2
5.	Define the term “resonance”.	2	K1	CO3
6.	Write the types of vibration.	2	K1	CO3
7.	Define heat transfer.	2	K1	CO4
8.	Write the FE equation for tapered fin.	2	K1	CO4
9.	Draw the graph for stress and strain curve for mild steel.	2	K2	CO5
10.	What is material Non-Linearity?	2	K1	CO5

PART - B (5 × 13 = 65 Marks)

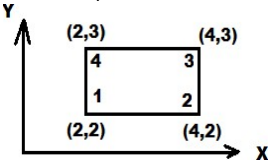
Answer ALL Questions

11. a) i)	Explainthevariousmethodsofengineeringanalysiswithsuitableillustrations.	8	K2	CO1
ii)	Describe the principle of stationary total potential energy.	5	K2	CO1

OR

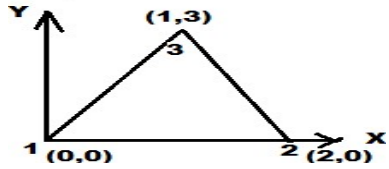
b)	Solve the differential equation for a physical problem expressed as $d^2y/dx^2+100 =0, 0\leq x\leq 10$ with boundary conditions as $y(0)=0$ and $y(10)=0$ using (i) Point collocation method (ii) Sub domain collocation method (iii) Least squares method and (iv) Galerkin method.	13	K2	CO1

12. a)	For a 4-noded rectangular element shown in fig. Infer the temperature at the point (2.5, 2.5). The nodal values of the temperatures are T_1= 100°C, T_2=60°C and T_3=50°C and T_4=90°C. Also determine the 80°C isotherm.	13	K3	CO2

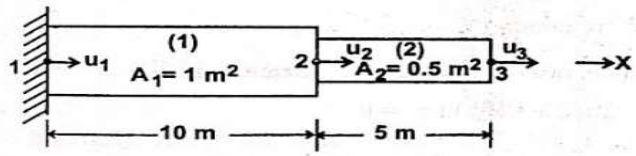


OR

b) Calculate the element stiffness matrix and temperature force vector for the plane stress element shown in fig. The element experiences a 20ºCincrease in temperature. Assume $\alpha = 6x10^{-6}$ C. Take $E=2x10^5$ N/mm^2, v=0.25, t= 5mm. *13 K3 CO2*



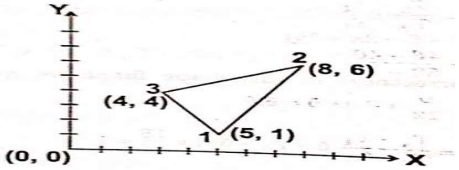
13. a) Determine the eigen values and frequencies for the stepped bar shown in fig. take $E=30X10^{10}$ N/m^2,sp.weight =8500Kg/m^3 *13 K3 CO3*



OR

b) Derive the equation of lumped mass matrix for the beam. *13 K3 CO3*

14. a) For a 3-noded linear triangular element shown in fig. determine the isotherm corresponding to 46°C. The temperature at node 1, 2 and 3 are 40°C,52°C ,44°C respectively. *13 K3 CO4*



OR

b) Derive the thermal stiffness matrix for 1 D steady state pure heat conduction element. *13 K3 CO4*

15. a) Explain incremental procedure to handle material non-linear problems. *13 K2 CO5*

OR

b) Explain the iterative procedure and modified iterative procedure for the analysis of material non-linearity Problems. *13 K2 CO5*

PART - C (1× 15 = 15 Marks)

16. a) Derive the equation of motion by Hamilton's principle. *15 K3 CO3*

OR

b) Determine the natural frequencies of the system shown in fig. *15 K3 CO3*