Code No. : 6388/N

FACULTY OF ENGINEERING

B.E. IV/IV (M/P) I SEMESTER (New) (Main) Examination, Nov./Dec., 2009

FINITE ELEMENT ANALYSIS

Time : 3 Hours] **[Max. Marks : 75**

Note : Answer **all** questions from Part – A. Answer any **five** questions from Part – B.

PART – A (25 Marks)

1. State the advantages and limitations of finite element method. 2
2. Distinguish between plane stress and plane strain condition. 2
3. Explain the procedure for calculation of stress in a bar element. 2
4. How do thermal stresses occur ? Explain with examples. 3
5. Explain the principle of virtual displacement and the principle of minimum potential energy for finite element problem formulation. 3
6. Explain the need for applying numerical integration for evaluation of coefficients of the stiffness matrix. 3
7. Obtain the shape functions in area coordinates for a linear triangle. 2
8. Explain the finite element problem formulation using Rayleigh-Ritz method. 3
9. Explain the finite element problem formulation by Galerkin Weighted Residual method. 3
10. Write the consistent mass matrix for a 2-node bar element. 2

PART – B (50 Marks)

11. Write the load vector, stiffness matrix and d.o.f. vector for the suspended tapered bar. Consider two elements. (Fig. 1)

E = 200 GPa, P = 77500 N/m^3

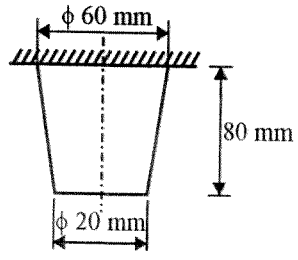

Fig. 1

12. Find the displacement at node 2 and the support reactions for the truss shown in fig. 2. $E = 20 \times 10^6$ N/cm^2.

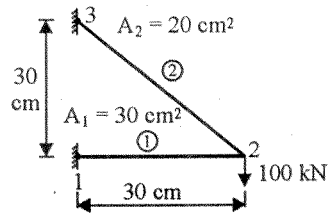

Fig. 2

13. Obtain the deflection at node 2 for the beam shown in fig. 3. EI = 9000 kN m^2.

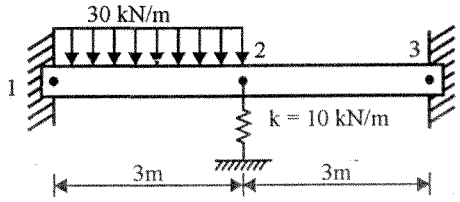

Fig. 3

14. A quadrilateral element shown in fig. 4 is subjected to a distributed load normal to the edge 2-3. Obtain the nodal loads 2-3. Thickness : 10 mm.

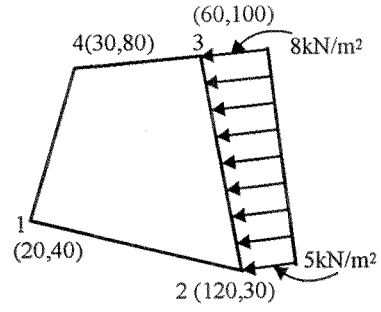

Fig. 4

15. Determine the temperatures at nodes 2 and 3 of the composite wall (fig. 5). Wall temperature T_1 = 100 °C. Outside air temperature is 50 °C with convection coefficient h = 10 W/m^2 °C.

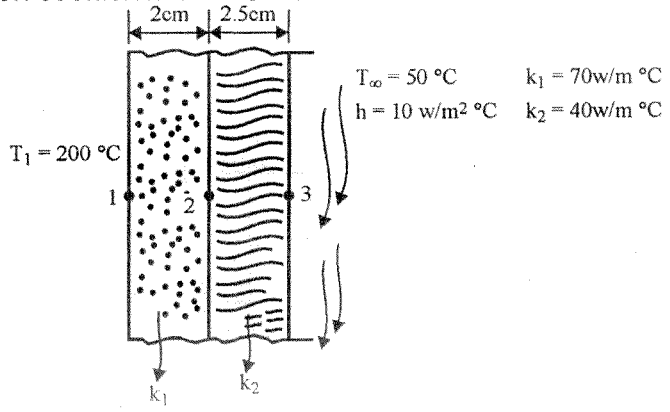

Fig. 5

16. A rectangular fin shown in fig. 6 is attached to a surface at 100 °C. The lateral surface and the top are exposed to ambient temperature of 20 °C. Consider two elements. Compute the temperatures at the nodes.

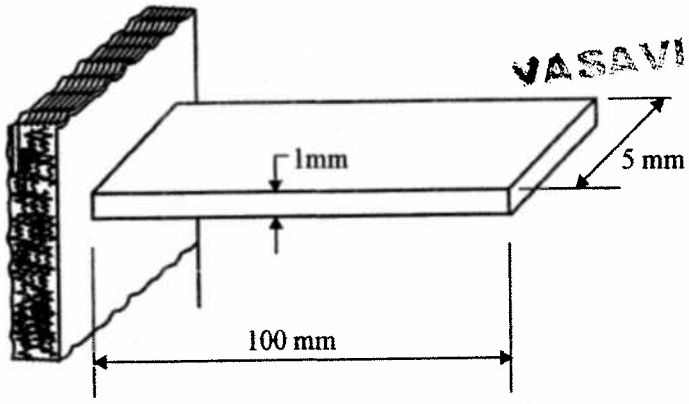

Fig. 6

17. Obtain the eigen values and eigen vectors for the bar fixed at one end due to axial vibrations.
