SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act, 1956)

Course & Branch: B.E – Aeronautical
Title of the paper: Finite Element Method
Semester: VI — Max. Marks: 80
Sub.Code: 526E01 — Time: 3 Hours
Date: 13-11-2008 — Session: AN

PART – A (10 x 2 = 20)

Answer All the Questions

1. Define finite element method.

2. What do you mean by C^1 continuity?

3. Define Bar element.

4. Mention the degrees of freedom for a Beam element?

5. Differentiate skeletal and continuum structures.

6. What do you mean by Axisymmetric problem?

7. Define Isoparametric elements.

8. Why Quass – Quardrature method is preferred in F.E.M?

9. Mention any 2 finite element software.

10. Write the common governing differential equation for a field problem.

PART – B (5 x 12 = 60)

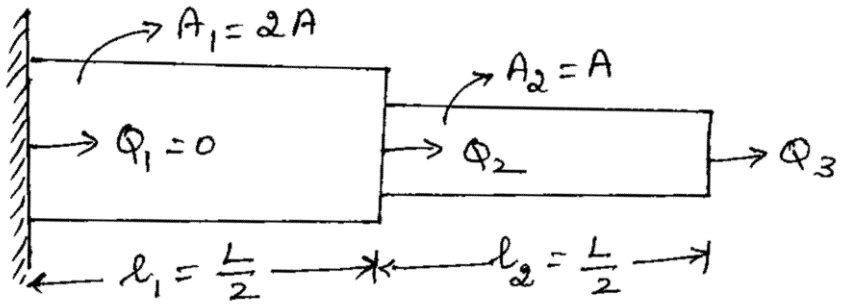
Answer All the Questions

11. Explain the conditions that a displacement function of an element should satisfy for convergence requirement.

(or)

12. Derive the stiffness matrix for a 2 noded 1D element and listout the properties of a stiffness matrix.

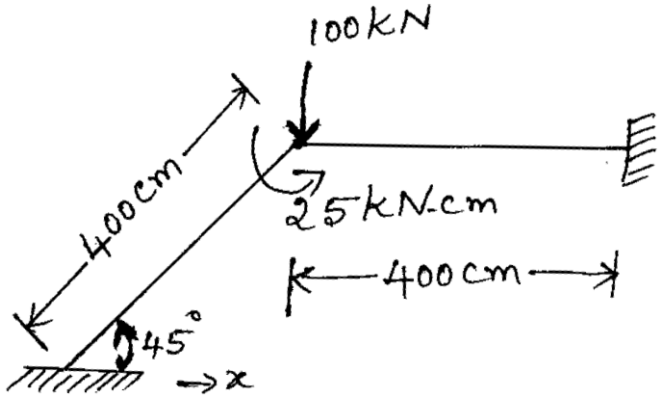
13. Find the natural frequencies of longitudinal vibration of the constrained stepped bar shown in fig.1.



(or)

14. Calculate all the displacements for the 2-member rigid frame shown in fig.2.

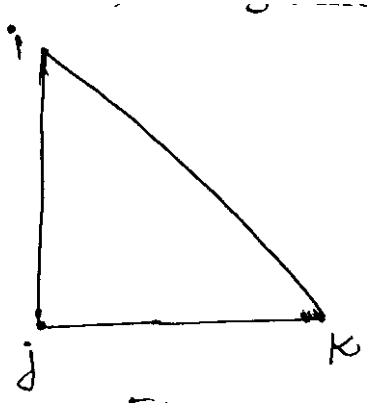
A = 30cm^2; I = 400cm^4; E = 2 x 10^{7}N/cm^2 for both members.



15. Explain the application of FEM to the solution of axisymmetric problems, with example.

(or)

16. Consider the triangular element shown in Fig.3. The element is extracted from a thin plate of thickness 0.5cm. The material is hot rolled low carbon steel. The nodal co-ordinates are $X_i = 0$; $Y_i = 0$; $X_j = 0$; $Y_j = -1$cm; $X_k = 2$cm ; $Y_k = -1$cm. Determine the element stiffness matrix. Assume plane stress analysis.



17. Evaluate $I = \int_{-1}^{+1} \left[3e^x + x^2 + \frac{1}{(x+2)} \right] dx$ Using one sampling point and two sampling point Gauss Formula.

(or)

18. Derive the shape function equations for a quadratic element in Natural co-ordinate.

19. Develop the necessary finite element equations for the analysis of straight uniform fin.

(or)

20. With an example explain how to develop a computer program for potential function approach.