

Fig.1

13. Define shape function. List its properties. [K₁]
14. Why polynomials are generally used as shape function? [K₂]
15. State the principle of minimum potential energy. [K₁]
16. What are the conditions for a problem to axisymmetric? [K₂]
17. What is the purpose of Isoparametric elements? [K₂]
18. What is a CST element? [K₂]
19. What is meant by post processing? Also List the two advantages of post processing. [K₂]
20. Name any four FEA software's. [K₂]

PART C (10 x 5 = 50 Marks)

21. What are the classifications of coordinates? Explain each in detail. [K₂]
 22. Apply Rayleigh Ritz concept to calculate the max deflection of a simply supported beam with uniformly distributed load throughout its length 'l'. [K₃]
 23. What is meant by plane stress analysis? Write down the stress-strain relationship matrix for plain stress condition. [K₂]
 24. List the various steps involved in finite element analysis. Explain discretization in detail. [K₂]
 25. Consider a 2 noded bar element shown in Fig.2. Cross sectional area of the bar is 600 mm² and Young's modulus is 2 X 10⁵ N/mm². If u₁=0.625 mm and u₂=0.75 mm. Calculate the following [K₂]
- (i) Displacement at point P
 - (ii) Strain

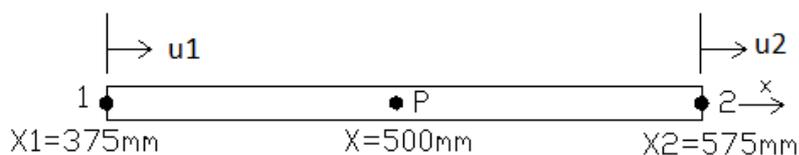


Fig.2

26. Explain the following with neat sketch [K₂]
- (i) Isoparametric element
 - (ii) Superparametric element
 - (iii) Subparametric element
27. Why higher order elements are needed? Determine the shape functions of an eight noded rectangular element [K₃]
28. Define Jacobian matrix. Write down the jacobian matrix for four noded quadrilateral element. [K₂]
29. Illustrate degrading technique with example. [K₃]
30. List the desirable features of FEA packages. [K₂]

PART D (2 x 10 = 20 Marks)

31. Consider a three bar truss as shown in Fig.3. It is given that $E = 2 \times 10^5 \text{ N/mm}^2$. [K₄]
- Calculate the following:

- (i) Nodal Displacements
- (ii) Stress in each member
- (iii) Reactions at the support.

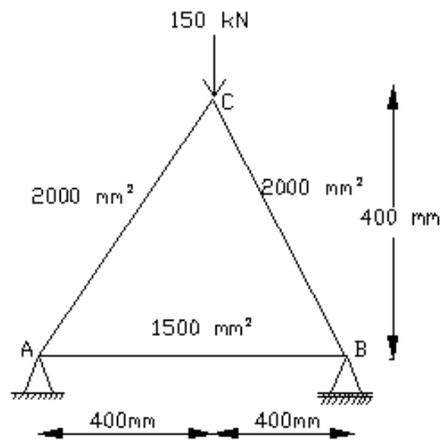


Fig.3

32. Evaluate the Jacobian matrix for the Isoparametric quadrilateral element shown in Fig.4. [K₄]

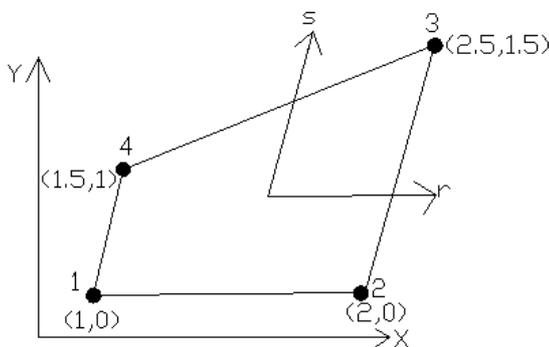


Fig.4
