Total No. of Questions :8]

SEAT No. :

P4496

[Total No. of Pages : 2

[5355] - 45
M.E. (Civil -Structural Engineering)
FINITE ELEMENT ANALYSIS
(2013 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt any 5 questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Use of non programmable electronic calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Solve using point collocation as well as least square method the given differential equation $\frac{d^2y}{dx^2}+\frac{dy}{dx}-2y=0$ with boundary conditions, $y(x=0)=0$ and $y(x=1)=1$. **[6]**

b) State the principle of minimum potential energy. Explain with a suitable example its application to derive elemental stiffness matrix. **[4]**

Q2) a) Derive the K matrix for rectangular element for plane elasticity problem using A^{-1} matrix, where A is the coordinate matrix of the element. **[6]**

b) Explain the use of Pascal's triangle and tetrahedron to write the displacement function. Explain the term 'Geometric Invariance' relevant to it with suitable example. **[4]**

Q3) A bar of 30 cm length is shown in Fig. 1. Find the end reactions for the bar and displacement at the point of application of load using direct stiffness method of FEM. **[10]**

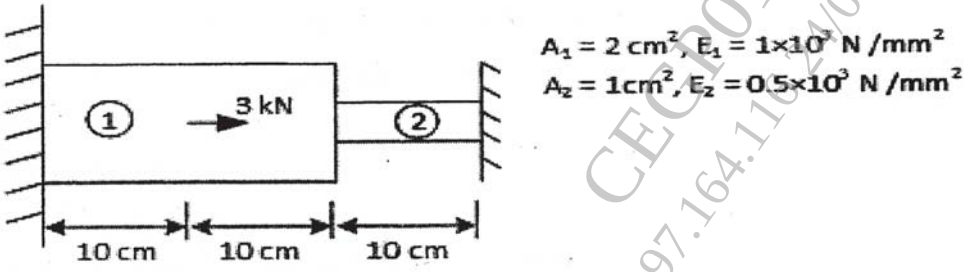

Fig 1

P.T.O.

Q4) a) Derive the shape function for a beam element from basic principle. **[5]**

b) Derive the shape function for a five noded rectangular element in natural coordinate system, where four nodes are primary external nodes and fifth is secondary external node located at midpoint of a side. **[5]**

Q5) Write a short note on the axisymmetric elements and give the elasticity matrix [D] for the axisymmetric element. Derive from the first principles (Assuming displacement function) the stiffness matrix for a typical triangular axisymmetric element. **[10]**

Q6) Explain isoparametric formulation. For the isoparametric quadrilateral element having coordinates A (3, 1), B(6, 1), C(8, 6), D(2, 5), determine the local coordinates of point having coordinates P(7, 4). **[10]**

Q7) Compare between the rectangular plate bending element with 12 degrees of freedom with that of plate bending element with 16 degrees of freedom. Emphasis on conformity of the element. **[10]**

Q8) Write a short note on : **[10]**

a) Flat & curved shell element.

b) Ahmad's degenerated solid element.