Total No. of Questions : 6]

SEAT No. :

P3976

[Total No. of Pages : 2

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M.E. (Civil) (Structures)

FINITE ELEMENT METHODS

(2008 Pattern) (Semester - II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non programmable calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive element stiffness matrix for one dimensional bar element in local coordinate system by using **[15]**

i) Direct stiffness method and

ii) Principle of minimum potential energy.

b) Explain step by step procedure of finite element analysis. **[5]**

c) Explain variational methods and their applications in finite element analysis. **[5]**

Q2) a) Determine shape function for a CST element. Prove that the natural co-ordinates are nothing but are co-ordinates for CST element of 2D problem. **[15]**

b) State and explain 'Convergence Requirements of displacement function'. **[5]**

c) Give three dimensional Pascal's triangle. Explain its use in FEM analysis. **[5]**

P.T.O.

Q3) a) A six noded rectangular element has 4 corner nodes and one node at the centre of the two edges parallel to x axis. The other two edges are parallel to y axis. Obtain the six shape functions using Lagrange interpolation. **[12]**

b) Explain the isoparametric concept and types of isoparametric elements in finite element analysis. Discuss their advantages over other elements. **[8]**

c) What do you mean by higher order elements? Explain its applications with examples. **[5]**

SECTION - II

Q4) a) Obtain element stiffness matrix of axisymmetric ring element with a triangular cross section using cylindrical coordinates. **[18]**

b) Explain the method of finding shape function for a hexahedral element using natural coordinates. **[7]**

Q5) a) What do you understand by C^0, C^1 and C^2 continuity? Explain with suitable examples. **[7]**

b) Write displacement functions for both ACM and BFS elements. Verify conformity of both the elements. **[18]**

Q6) a) Explain the concept of degenerated solid elements by suitable examples. **[7]**

b) Explain method of obtaining geometry shape functions and displacement functions for Pawsey's eight noded shell element. **[18]**