Total No. of Questions :8]

SEAT No. :

P3981

[Total No. of Pages :3

[4959]-1020

B.E. (Civil Engineering)

FINITE ELEMENT METHOD IN CIVIL ENGINEERING

(2012 Course) (Semester - II) (Elective - III)

Time : 2½ Hours *[Max. Marks :70]*

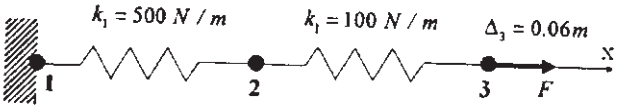
Instructions to the candidates:

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

SECTION - I

Q1) a) Explain in brief 2D and 3D Pascal's triangle with example. **[6]**

b) Determine elongation at node 2 and pulling force 'F' at node 3 for the spring assembly given below. Take pull at node 3 is 0.06m. **[6]**



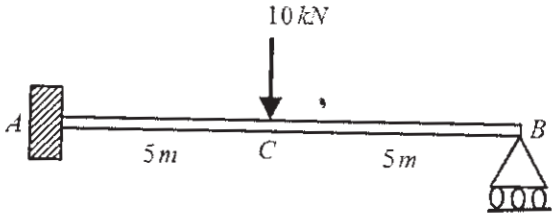
c) Derive stiffness matrix and transformation matrix for two noded frame element considering axial deformation, transverse deformation and rotation. **[8]**

OR

Q2) a) Explain in brief state of stress and state of strain at a point in 3D elasticity problem. **[6]**

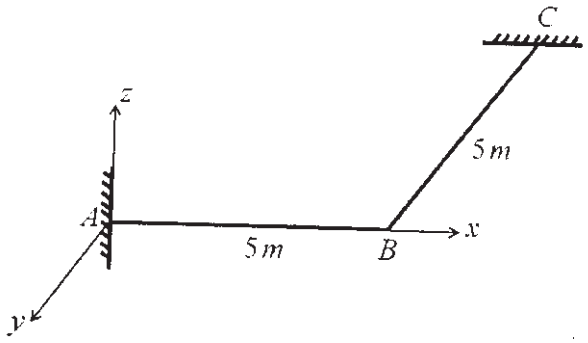
b) Obtain rotation at B for the beam shown below using finite element method. **[6]**

Consider given beam as one element. Take E = 2×10^8kN/m^2 and I = 4×10^{-6} m^4



P.T.O.

c) Derive the stiffness matrix for the grid elements as shown in Figure. Take flexural rigidity EI and torsional rigidity GJ same for both the elements. **[8]**



Q3) a) Explain difference between CST and LST element. **[6]**

b) Derive stiffness matrix for the two noded bar element using finite element formulation. **[12]**

OR

Q4) a) Write short note on applications of 3D elements in FEM and draw neat sketch of hexahedron element in natural coordinate system **[6]**

b) Derive strain displacement matrix [B] for the four noded rectangular element using finite element formulation. **[12]**

Q5) a) Derive the shape function for two noded bar element using polynomial in Cartesian coordinate system. **[6]**

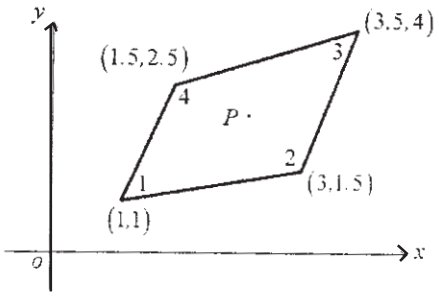
b) Derive shape functions for the four noded and nine noded rectangular elements in natural coordinate (ξ, η) system using Lagrange's interpolation function. **[10]**

OR

Q6) a) Derive area coordinates for the three noded CST element. **[8]**

b) Derive shape functions for the two noded beam element using polynomial in Cartesian coordinate system. **[8]**

Q7) a) Determine Cartesian coordinates of the point P (ξ= 0.8,η=0.9) as shown in Figure. **[8]**



b) Explain in brief isoparametric, superparametric and subparametric elements with suitable example. **[8]**

OR

Q8) Derive the Jacobian matrix for the four noded quadrilateral isoparametric elements as shown in Figures. **[16]**