Total No. of Questions : 6]

SEAT No. :

P966

[Total No. of Pages : 2

# APR-17/BE/Insem.-7

## B.E. (Civil Engineering) (Semester - II)

## FINITE ELEMENT METHOD IN CIVIL ENGINEERING

## (2012 Pattern) (Elective - III)

*Time : 1 Hour]* *[Max. Marks : 30*

***Instructions to the candidates:***

1) ***Answer Q.1 or 2, Q.3 or 4, Q.5 or 6.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

***Q1)*** Derive the saint venant's strain compatibility conditions for 3D elasticity problem. **[10]**

OR

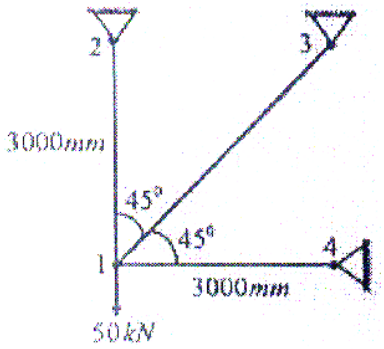
***Q2)*** Write short notes on plane stress 2D elasticity problem. **[10]**

a) State of a stress at a point

b) State of strain at a point

c) Generalized Hooke's law

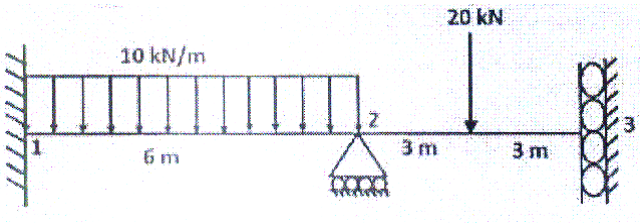
***Q3)*** For the plane truss composed of three elements shown in figure subjected to a downward force of 50 kN at node 1, determine the displacements at node 1 using finite element method. Take E = 200 GPa and A = 1000 $mm^2$ for all elements. **[10]**



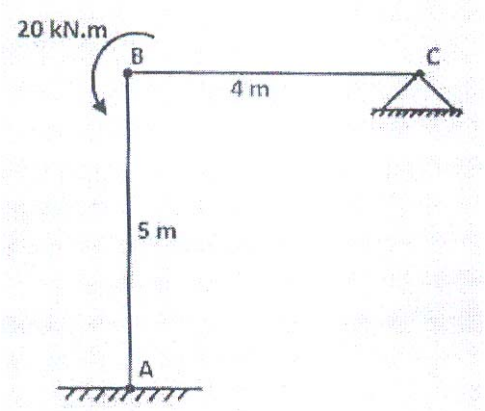

OR

***P.T.O.***

***Q4)*** A beam has fixed support at node 1, roller support at node 2 and guided support at node 3. Determine the bending moment diagram and the rotations of nodes 2 and 3 using finite element method. Take EI = $20 \times 10^3$ kN.m$^2$.**[10]**




***Q5)*** Determine the rotations of joint B and C of the frame as shown in figure using finite element method. Take EI=$10 \times 10^3$ KN.m$^2$. Neglect axial deformations.**[10]**




OR

***Q6)*** Determine unknown joint displacements at node B of the orthogonal grid as shown in figure. Take EI = 1500 kN.m$^2$ and GJ = 700 kN.m$^2$ **[10]**