Total No. of Questions : 6]

SEAT No. :

P3979

[Total No. of Pages : 2

[4860] - 51

M.E. (Civil) (Structures) (Semester - II)

NON-LINEAR ANALYSIS OF STRUCTURES

(Elective - III (d)) (2008 Pattern)

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) Find approximate solution for a moment-slope non linear analysis of a cantilever beam with point load at the free end. Plot load-deflection curves. **[12]**

b) Derive the governing nonlinear equation for a moderately thick beam due to stretching. **[13]**

Q2) a) Explain 'Displacement Equations Approach' of nonlinear analysis of plates. **[8]**

b) Write the strain energies due to stretching, bending and kinetic energy of an orthotropic plate. Use Hamilton's principle and stress function approach to derive governing equations. **[17]**

Q3) a) State and explain different boundary conditions for the nonlinear analysis of plates obtained from variational technique. **[13]**

b) State a system of four equations governing the large amplitude flexural vibrations of anisotropic plates. **[12]**

P.T.O.

SECTION - II

Q4) Obtain approximate solutions for the tip deflection components of cantilever column at post-buckling stage due non linear behaviour considering moment curvature relationship. **[25]**

Q5) a) Explain with diagrams and derivation, the deformation of square pinned-fixed frame for tensile loading. **[15]**

b) For a two-node truss element, develop the tangent stiffness matrix and force vector corresponding to the configuration at time t. Consider large displacement and large strain conditions. **[10]**

Q6) a) Obtain the displacement transformation matrix for a member with a hinge. **[12]**

b) Write procedure for elastic plastic analysis of **[13]**

i) Frames.

ii) Propped cantilever.