Total No. of Questions : 6]

SEAT No. :

P4190

[Total No. of Pages : 2

[4960]-51

M.E. (Civil Structures)

NON-LINEAR ANALYSIS OF STRUCTURE

(2008 Pattern) (Semester - II) (Elective - III)

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) State and explain techniques of non-linear analysis. **[6]**

b) State and explain types of nonlinearities, with examples, in the analysis of structure. **[6]**

c) Find the solution for a moment curvature by non linear analysis of a simply supported beam subjected to concentrated load at midspan. **[13]**

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

b) Using Hamilton's principal, derive a system of 13 governing equations of geometrically non linear behaviour of plate in terms of membrane forces, moment resultants, transverse shear forces, displacement components and slope functions. **[17]**

Q3) a) Derive the simplified nonlinear governing equation using Berger approximation for plates with immovable boundaries. **[13]**

b) State and explain different boundary conditions for the nonlinear analysis of plates obtained from variational technique. **[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 compressive 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) Write steps involved in elastic plastic analysis of frames. **[12]**

b) Obtain statics matrices by Elastic-Plastic Analysis for a member with **[13]**

i) a plastic hinge at end l

ii) a plastic hinge at end 2

iii) hinges at both the ends