



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.Tech (CE-NEW)/SEM-8/CE-801/3/2010**

**2010**

**ADVANCED STRUCTURAL ANALYSIS**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

**GROUP – A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

i) Size of the stiffness matrix for a structure having 3 DOF  
is

a) 3 × 3

b) 3 × 2

c) 2 × 2

d) 2 × 3.

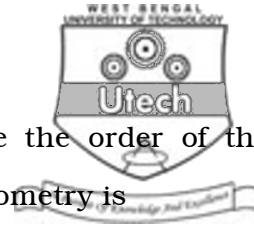
ii) Basic wind speed is measured at ..... m height in  
India.

a) 12

b) 15

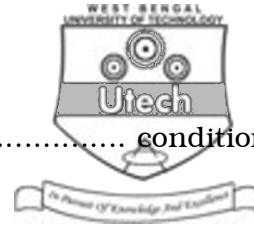
c) 10

d) 20.



- iii) Isoparametric element is that where the order of the shape function of deformation and geometry is
- a) equal
  - b) unequal
  - c) symmetric
  - d) asymmetric.
- iv) As per IS 1983 2002 there are ..... nos. of seismic zones in India.
- a) 5
  - b) 3
  - c) 4
  - d) 2
- v) A material is said to be more seismic efficient if it is
- a) ductile
  - b) brittle
  - c) malleable
  - d) isotropic.
- vi) The problem where boundary conditions are known is termed as
- a) Boundary value problem
  - b) Initial value problem
  - c) Equilibrium problem
  - d) Eigenvalue problem.





xii) In Force method we want to achieve ..... condition in boundaries.

- |                |                  |
|----------------|------------------|
| a) Equilibrium | b) Compatibility |
| c) Consistency | d) Deformation.  |

**GROUP – B**

**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

2. Show that if a dummy force applied at any point of truss and force generated any  $i^{\text{th}}$  member due to external load is  $P_i$  and due to application of unit load is  $K_i$  the deflection in the direction and location of the dummy force is  $\Sigma P_i K_i L_i / AE$ .
- 3.

Fig-(a) shows a rectangular 2-D element. Find the shape function using natural co-ordinate system ( Lagrangian shape function )



4. Form the stiffness matrix of a beam element subjected to axial & shear force and bending moment.
5. Write short notes on the following :
  - a) Interpolation function
  - b) Flexibility and stiffness
  - c) Statical indeterminacy and kinematic indeterminacy.
6. Describe the different categories of shell with a sketch.

**GROUP – C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. Solve the truss using flexibility method. Assume AE constant for the structure.



8. Find out the redundant forces using stiffness method.
9. What are the basic steps to be followed in a finite element formulation ? Formulate the stiffness matrix and hence the equation considering the virtual work using finite element technique for a truss element. 5 + 10
10. The figure below [ fig(d) ] shows a grid plan of a 5 storeyed building situated at New Delhi. Height of the ground floor is 2.4m from GL. Floor to floor height of the building is 3m. Find out the nodal force generated in either sides of the building using pressure coefficient method.



11. Derive the fourth order differentia equation of isotropic plate simply supported at four sides subjected to pure bending.

=====