Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (CE-N)/SEM-8/CE-802/5/2010

2010

STRUCTURAL DYNAMICS & EARTHQUAKE ENGINEERING

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 : $10 \times 1 = 10$

   i) IS code that deals with the criteria for earthquake resistant design of structures is

      a) IS : 1893 b) IS : 1983

      c) IS : 456 d) IS : 1392.

   ii) IS 1893 (Part-I) : 2002 deals with ..... for earthquake resistant design of structures.

      a) General provisions and buildings

      b) Liquid retaining structures

      c) Bridge and Retaining walls

      d) Dams and Embankments.

iii) IS 1893 (Part-II) : 2002 deals with ..... for earthquake resistant design of structures.

a) General provisions and buildings

b) Liquid retaining structures

c) Bridge and Retaining walls

d) Dams and Embankments.

iv) IS 1893 (Part-III) : 2002 deals with ..... for earthquake resistant design of structures.

a) General provisions and buildings

b) Liquid retaining structures

c) Bridge and Retaining walls

d) Dams and Embankments.

v) IS 1893 (Part-IV) : 2002 deals with ..... for earthquake resistant design of structures.

a) General provisions and buildings

b) Liquid retaining structures

c) Bridge and Retaining walls

d) Dams and Embankments.

vi) Earthquake resistant design & construction of buildings is guided by

a) IS 1893 b) IS 4326

c) IS 13827 d) none of these.

vii) In India seismic zone map is divided into

a) 3 zones b) 4 zones

c) 5 zones d) none of these.

viii) A dynamic periodic load is that which

a) varies in magnitude with time and repeats itself at regular intervals

b) varies in magnitude with time and does not repeat itself at regular intervals

c) does not vary in magnitude with time and repeats itself at regular intervals

d) none of these.

ix) The equation of motion for undamped free vibration is

a) $m\dot{u} + ku = 0$

b) $m\ddot{u} + c\dot{u} + ku = f(t)$

c) none of (a) and (b)

d) both of (a) and (b).

x) The equivalent stiffness of a system comprising of two linear springs (constants K_1 & K_2) connected in parallel is

a) $K_1 + K_2$ b) $\frac{K_1 K_2}{K_1 + K_2}$

c) $\frac{1}{K_1 + K_2}$ d) none of (a), (b) and (c).

xi) For a full description of movement of a structure, the no. of degrees of freedom is defined with

a) minimum no. of variables

b) maximum no. of variables

c) both of (a) and (b)

d) none of (a) and (b).

xii) Brick masonry structure is

a) strong against seismic force

b) weak against seismic force

c) none of (a), (b).

d) not affected by seismic force.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. What do you mean by d.o.f (degree of freedom) of a system ? Give examples of SDOF and MDOF systems.

3. Derive the equation of motion of a dynamic system from D'Alembert's principle.

4. What do you mean by damping of a system ? Discuss in brief critical damping.

5. Make a comparison between static analysis and dynamic analysis.

6. Find the natural frequency of the cantilever beam with attached mass system as shown in figure 1, L = 1 m, EI = Unity, K = 3 units.

Dia.

Figure 1

7. Find the natural frequency of the two simply supported beams with attached mass system as shown in figure 2, L = 1 m, EI = Unity, K = 48 units.

Dia.

Figure 2

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

8. What do you mean by forced vibration ? Derive the solution for the steady state condition of the SDOF system of $m\ddot{x} + c\dot{x} + kx = F \cos pt$, where notations have their usual meanings.

9. What is Resonance ? What is meant by Dynamic Load Factor (DLF) ? Evaluate DLF if P = 80% of natural frequency with 5% damping ratio.

10. Calculate the natural frequency and time period of the cantilever beam in the flexural mode of vibration.

Dia.

Assume lumped mass for simplification.

11. Evaluate the solution of a damped free vibration SDOF system.

12. Write short notes on the following :

    a) Epicentre

    b) Seismograph

    c) Seismic zoning.

13. Discuss the fundamental concept of ductile detailings.