ANNA UNIVERSITY
DEPARTMENT OF CIVIL ENGINEERING
BE CIVIL ENGINEERING (P·T)
PTCE 481 / PTCE 9402 – STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING
(R - 2002, 2005, 2009) .

Max Marks: 100   Time : 3 Hrs

Answer all Questions

[IS 1893:2002 (part1), IS 13920:1993, IS 456:2000 are permitted]

Part A (10 x 2 = 20)

1. What is the difference between static analysis and dynamic analysis of structures?

2. What is the role of damping in any structure? What are the methods to determine the damping ratio in a system?

3. What is meant by mode shapes in a multi degree of freedom system?

4. What is meant by orthogonality principle in multi degree of freedom system?

5. Differentiate between Rayleigh waves and love waves.

6. Explain the characteristics of an earthquake.

7. What is meant by liquefaction? What are the effects of Liquefaction?

8. Differentiate between the performance of RC structures and Prestressed concrete structures.

9. Differentiate between ordinary moment resisting frames and specially confined moment resistant frames.

10. What is the difference between elastic response spectrum and design response spectrum?

Part B (5 x 16 = 80)

11. Derive the Equilibrium equation of motion for the structural system shown in Fig.Q.No.11. Total length of the beam is l. Find out the natural frequency of the system.
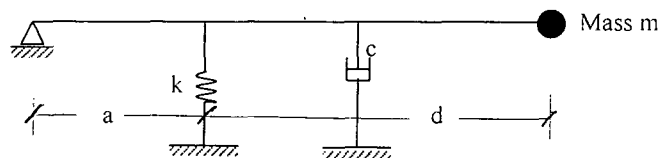

Fig. Q.No.11

12.

a. Find out the response of the multi-degree of freedom system as shown in Fig.Q.No.12(a) with the initial condition $x_1(0) = x_2(0)$ and $\dot{x}_1(0) = \dot{x}_2(0) = 0$
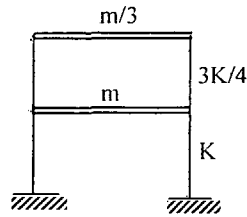
m/3

m

3K/4   Fig. Q.No.12(a)

K

OR

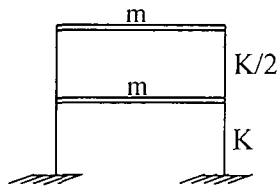b. Plot the mode shapes of MDOF system as shown in Fig. Q.No.12 (b).

m

m

K/2

K   Fig. Q.No.12(b)

13.

a. What is the need for seismic zonation of a country? How many seismic zones are there in Indian subcontinent? What are the inference taken from each earthquake happened in India for the devellopment of seismic codes?

OR

b. What is role of ground water level on the seismic behaviour of soil? What is the effect of soil-structure-interaction in the design of important structures?

14.

a. What are the effects of earthquake on masonry and RC structures? What is the effect of vertical and horizontal irregularity on the seismic performance of structures?

OR

b. Discuss on the dynamic analysis of structures. What are the basic difference between Response Spectrum analysis and Time History analysis?

15.

a. Consider a five-storey reinforced concrete (SMRF) residential building plan is as shown in Fig.Q.No.15(a). The building floors are at 3.0m c/c. The building is located at Delhi. The soil condition is medium and the entire building is supported on a raft foundation. The R. C. frames are infilled with brick-masonry. The lumped weight due to dead loads is 12kN/m^2 on floors and 9 kN/m^2 on the roof. The floors are to cater for a live load of 3 kN/m^2 on floors and 1.5 kN/m^2 on the roof. Determine design seismic load on the structure as per IS 1893 :2002

and distribute the earthquake load along the height of the building and comment on the results.
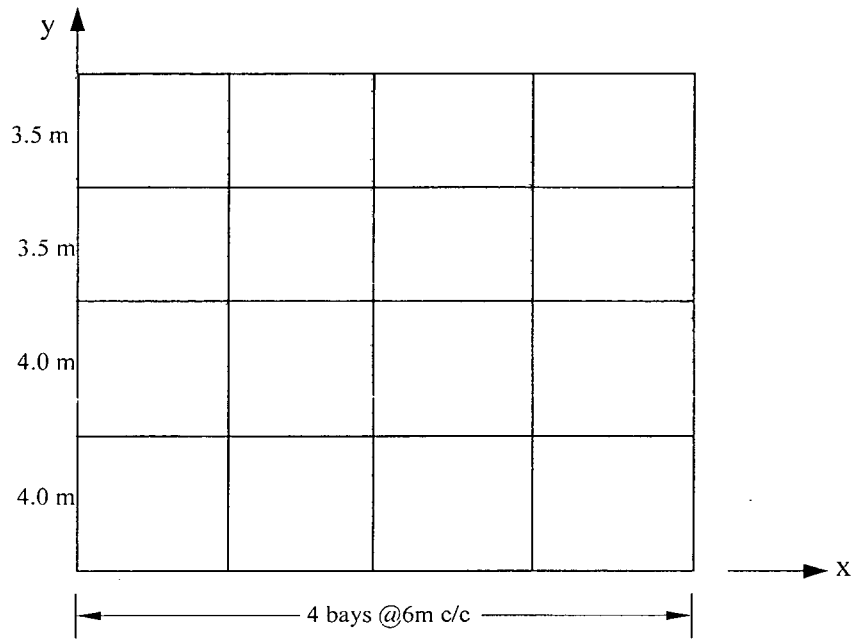
Plan of the building

Fig.Q.No.15(a)

OR

b.   Write Short notes on
     i.   Plate tectonics
     ii. Characteristics of Bhuj Earthquake
     iii. Modes of vibration
     iv. Engineering Seismology