B.E. / B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2011

CIVIL ENGINEERING
EIGHTH SEMESTER

(6)

CE 481 – STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING

(REGULATIONS 2004)

Time: 3 Hrs Max Marks: 100

Instructions: 1.Answer all Questions
2.IS 1893:2002 (part1), IS 13920:1993, IS 456:2000 are permitted

Part A

10 x 2 = 20

1. Define Degree of freedom. What is the degree of freedom for the water tank as a lumped mass model analysis?
2. Define damping. Describe the methods to determine the damping ratio in a system.
3. What is meant by modal superposition and modal participation factor?
4. How you will define the fundamental natural frequency for a multidegree of freedom system?
5. Differentiate between intensity and magnitude of earthquake.
6. Describe the different types of waves generated during earthquake? In what way these waves help in assessing the location of earthquake shock?
7. What is meant by liquefaction? What are the effects of Liquefaction
8. Describe Pinching effect and Bauschinger effect
9. What is meant by confinement? Describe the influence of stirrups in the confinement of concrete.
10. Explain the effect of configuration in the earthquake resistant design of structures.

Part B

5 x 16 = 80

11.

a. A diver weighing 100 kg at the end of a diving board, which cantilevered out by 1m. The diver oscillates at a frequency of 2 Hz. What is flexural rigidity of the diving board? (6)

b. The natural period of a SDOF system is 0.5 sec. The system is subjected to some initial displacement 25mm and allowed to vibrate its own. The displacement observed after 2.5 sec was 10 mm. If the mass of the system is 200kg, determine (i) natural circular frequency, (ii) stiffness, (iii) damping ratio, (iv) damped circular natural frequency and (v) critical damping coefficient of the system (10)

12.

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

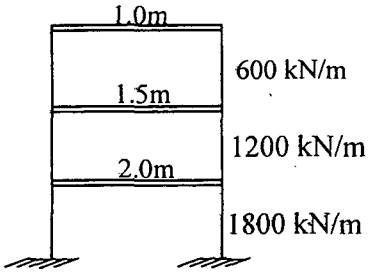


Fig. Q.No.12(a)

OR

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

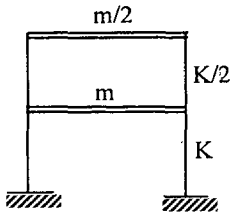


Fig. Q.No.12(b)

13.

a. What are the important observations from past earthquakes on the development of Indian seismic codes? What are the lessons learned from the past Indian earthquakes?

OR

b. What is meant by Soil-Structure-Interaction and how is it affect the dynamic behavior of structures?

14.

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

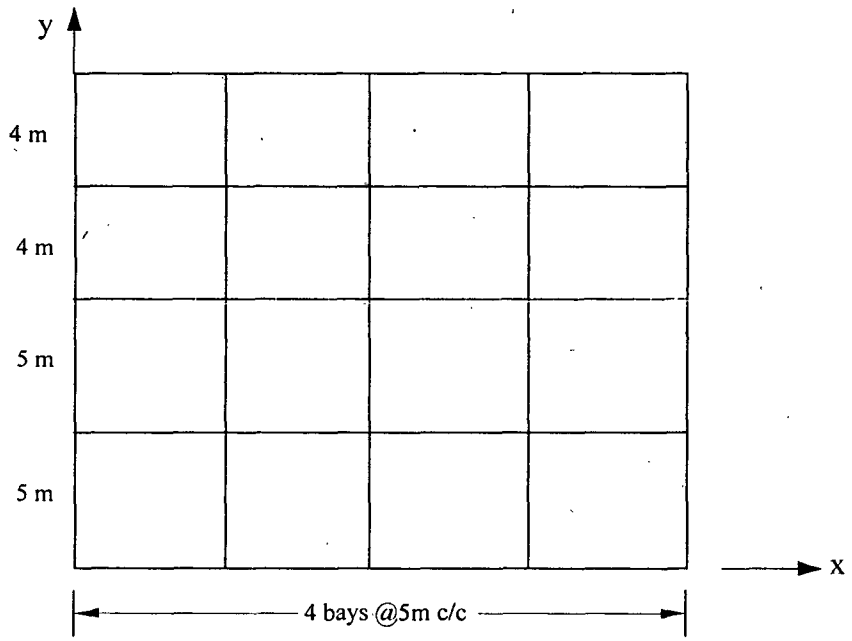
OR

b. What are the different types of structural systems? Explain the performance of these different structures during earthquake.

15.

a. Consider a five-storey reinforced concrete (SMRF) office building plan is as shown in Fig.Q.No.15(a). The building floors are at 3.5m c/c. The building is located at Pune. The soil condition is hard 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 15kN/m^2 on floors and 10 kN/m^2 on the roof. The floors are to cater for a live load of 4.5 kN/m^2 on floors and 2 kN/m^2 on the roof. Determine design

Chennai. 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 10 kN/m^2 on the roof. The floors are to cater for a live load of 4.5 kN/m^2 on floors and 2 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.



Plan of the building

Fig.Q.No.15(a)

OR

b. Write Short notes on
   i. Transmissibility
   ii. Modes of vibration
   iii. Engineering Seismology
   iv. Ductility and Energy Dissipation.