

BE DEGREE END SEMESTER EXAMINATIONS, JULY/DECEMBER 2011
CIVIL ENGINEERING BRANCH
SEVENTH SEMESTER – REGULATIONS 2008
CE 9402 – STRUCTURAL DYNAMICS AND
EARTHQUAKE ENGINEERING

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 effect of (i) gravitational force and (ii) base excitation on the equilibrium equation of motion of system under vibration?
2. What is meant by amplification factor? Draw the amplification graph with respect to frequency ratio.
3. What is the fundamental natural frequency for a multidegree of freedom system?
4. List the recent Indian earthquakes with year and magnitude of occurrence.
5. List the objectives of Aseismic design.
6. Define Response Reduction Factor.
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. Derive the Equilibrium equation of motion for the structural system shown in Fig.Q.No.11. Find out the natural frequency of the system.

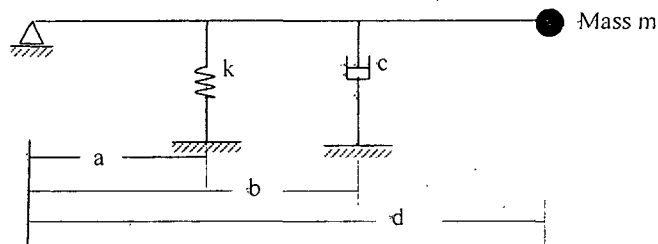


Fig. Q.No.11

12.

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

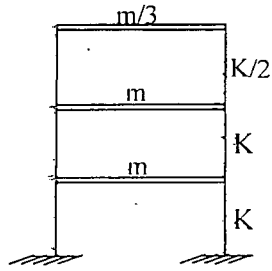


Fig. Q.No.12(a)

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 $\dot{x}_1(0) = \dot{x}_2(0) = 0$

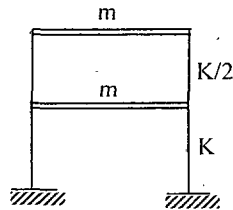


Fig. Q.No.12(b)

13.

- (a) (i) Explain briefly "Design Spectrum". (4)
(ii) Write about "Behaviour of RC structures in the past Earthquakes" and suggest some improvements that may be done to overcome such deficiencies. (12)

OR

- (b) Explain the following :
(i) Static versus Dynamic Analysis. (8)
(ii) Ductility and Energy Dissipation. (8)

14.

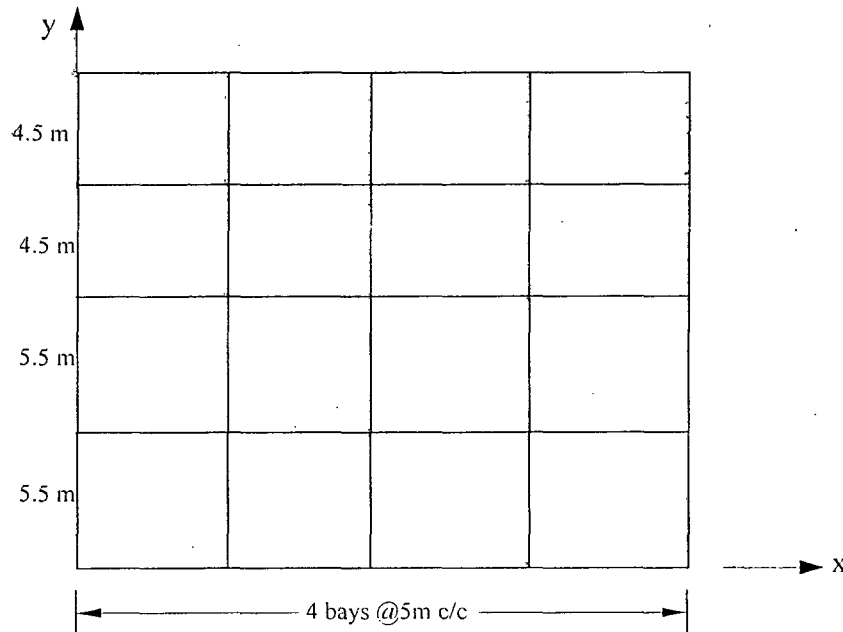
- a. Discuss about the seismic behaviour of (i) Steel and (ii) Pre-stressed Concrete Structures. Explain with the corresponding Hysteretic curves.

OR

- (b) (i) What are the different lateral systems for concrete buildings? (Give sketches) (12)
(ii) For a column of diameter 300 mm, concrete grade M 20, steel be Fe 415, design the confining reinforcement. (4)

15.

- a. Consider a four-storey reinforced concrete (OMRF) office building plan is as shown in Fig.Q.No.15(a). The building floors are at 3m 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 15 kN/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
- Transmissibility
 - Plate tectonics
 - Modes of vibration
 - Engineering Seismology