Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 31028

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Eighth Semester

Civil Engineering

080100067 — EARTHQUAKE RESISTANT STRUCTURES

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

Use of IS 1893 and IS 13920 are permitted.

PART A — (10 × 2 = 20 marks)

1. Distinguish between a static problem and a dynamic problem.
2. What are the different types of structural vibration?
3. What is the principle behind the working of an accelerometer?
4. Define the terms: critical damping and beating phenomenon.
5. Give two examples for two degrees of freedom systems.
6. What are the characteristics of a strong earthquake ground motion?
7. What the different types of seismic waves? Indicate their direction of propagation.
8. What is a response spectrum?
9. What is the cause of soil liquefaction?
10. Detail a reinforced concrete beam to column junction as per IS 13920.

PART B — (5 × 16 = 80 marks)

11. (a) A block of weight 700 N (moving between vertical guides) is supported by a spring of stiffness 10^6 N/m. The block is given an initial displacement of 50 mm with a velocity of 300 mm/sec.

    (i) Determine the period of vibration, natural frequency, amplitude of motion, maximum velocity and maximum acceleration of the block.

    (ii) If the return swing during second cycle is 40 mm in 0.3 seconds determine the damping ratio and damping coefficient of the system. (8+8)

Or

(b) Find the response for the forced vibration phase of the SDOF system shown in fig Q 11 b for zero initial conditions if m = 3kg, k = 2000N/m, $F_0 = 500$ N and $t_1 = 0.2$ sec.

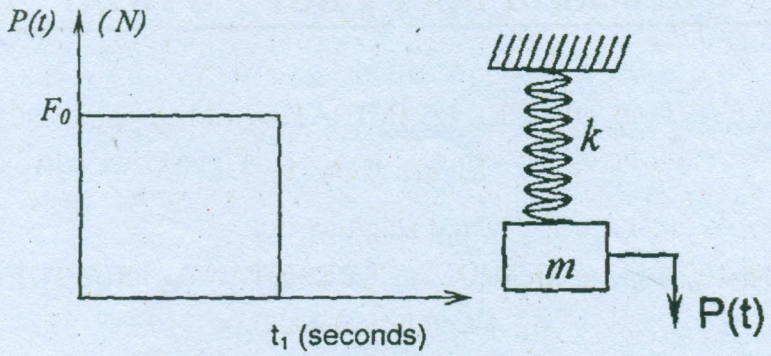

Fig Q 11 (b)

12. (a) Obtain the natural frequencies and mode shapes for the system shown in figure Q. 12 a. Also draw the mode shapes. Take $m = 3$ tons and $k = 1000$ kN/m.

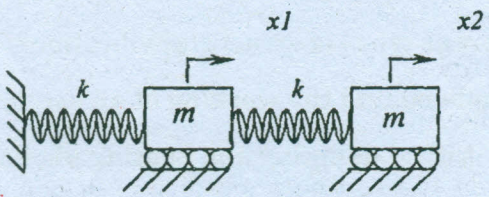

Fig Q 12 a

Or

(b) Obtain the steady state response for forced vibration phase using modal analysis for the shear frame shown in figure Q 12 b. (stiffness, k = 3000 kN/m and mass of each floor, m = 1.5 tons).

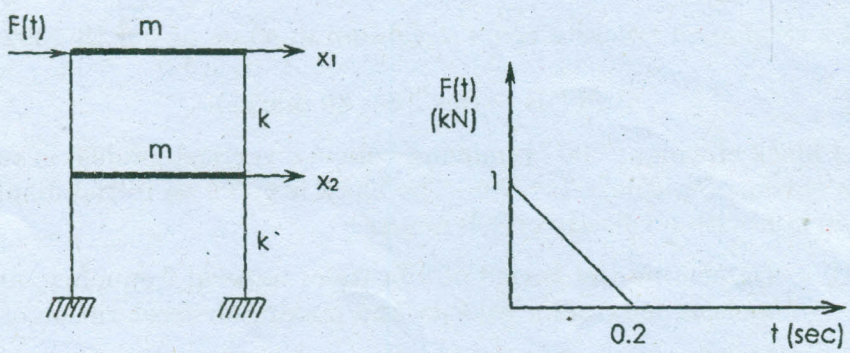

Fig Q 12 b

13. (a) Explain in brief the Indian seismicity and seismic zonation.

Or

(b) Explain the effects of soil-structure interaction due to seismic waves.

14. (a) Explain the concept of design spectrum with neat sketches.

Or

(b) Determine the design lateral forces at each level for a two story RC shear frame of a hospital building for the following data. Use Response spectrum method of IS 1893-2002.

Seismic weight of each floor	:	80 kN
Spacing between columns	:	3 m c/c
Height of each floor	:	3.1 m
Type of Structure	:	SMRF
Location of the building	:	Chennai
Type of soil	:	Rock
Combined stiffness of ground floor columns	:	3000 kN/m
Combined stiffness of first floor columns	:	2500 kN/m

15. (a) Explain briefly the concepts of seismic design with reference to design philosophy, methodology and building configurations.

Or

(b) Explain the step by step procedure of the analysis and design of a RC frame subjected to seismic forces.

———————