USN | | | | | | | | | |

18CV741

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024
Earthquake Engineering

Time: 3 hrs.   Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS-1893-2016, 13920-2016 is permitted.

Module-1

1   a. What are plate tectonics and how are they related to continental drift and sea floor spreading?   **(08 Marks)**
     b. Discuss briefly the measures of an earthquake.   **(06 Marks)**
     c. Describe briefly the direct and indirect effects of an earthquake.   **(06 Marks)**

OR

2   a. With a neat sketch, explain the various terminology of an earthquake.   **(07 Marks)**
     b. Give the classification of different types of earthquake.   **(08 Marks)**
     c. Explain in brief the seismic zoning of India.   **(05 Marks)**

Module-2

3   a. Explain the mathematical modeling of SDOF system with a neat sketch.   **(06 Marks)**
     b. Discuss the various methods of measuring of damping.   **(08 Marks)**
     c. A vertical cable 3 m long has a cross sectional area of 4 cm^2 supports a weight of 50 kN. What will be the natural period and natural frequency of the system? $E = 2.1 \times 10^6 \, kg/cm^2$.
                                                                                     (06 Marks)

OR

4   a. Explain the construction of tripartite graph.   **(08 Marks)**
     b. Explain in brief magnifaction factor and beating phenomenon.   **(08 Marks)**
     c. Derive an expression for effective stiffness of springs connected in parallel.   **(04 Marks)**

Module-3

5   a. What are the different failures observed from past earthquakes for masonry buildings?
                                                                                     (04 Marks)
     b. Explain the various techniques of a seismic design.   **(08 Marks)**
     c. Explain the different types of irregularities in buildings.   **(08 Marks)**

OR

6   a. With a neat sketch, explain weak beam-strong column concept.   **(06 Marks)**
     b. Explain the different lateral load resistant frame systems.   **(08 Marks)**
     c. Mention the various earthquake-resistant design methods and explain any one in brief.
                                                                                     (06 Marks)

Module-4

7   a. What are the assumptions made in the idealization of a shear building?   **(06 Marks)**
     b. A three storeyed symmetrical RC School building situated at Bhuj with the following data:
         Plan dimensions – 7 m ;   Storey height – 3.5 m
         Total weight of beams in storey – 130 kN ;   Total weight of slab in storey – 250 kN
         Total weight of column in storey – 50 kN ;   Total weight of walls in storey – 530 kN
         Live load – 130 kN ;   Weight of terrace floor – 655 kN
         The structure is resting on hard rock. Determine the total base shear and lateral loads at each floor levels for 5% of damping using seismic coefficient method.   **(14 Marks)**

OR

8   Consider a four storey RC office building as shown in Fig. Q8. The building is located in zone V on medium stiff soil and supported on raft foundation. The RC frames are infilled with brick masonry. The lumped weight due to dead loads is 12 kN/m² and 10 kN/m² on floors and roof respectively. Live load on floors is 4 kN/m² and on roof is 1.5 kN/m². Determine the design seismic forces and show the distribution show the distribution of lateral forces with building height using dynamic analysis.

Storey Level	Natural period	Mode 1	Mode 2	Mode 3
Roof	Mode 1 0.860	1.000	1.000	1.000
3rd	Mode 2 0.265	0.904	0.216	− 0.831
2nd	Mode 3 0.145	0.716	− 0.701	− 0.574
1st	-	0.441	− 0.921	1.016

Fig. Q8 (i)

Elevation
All dimensions in mm
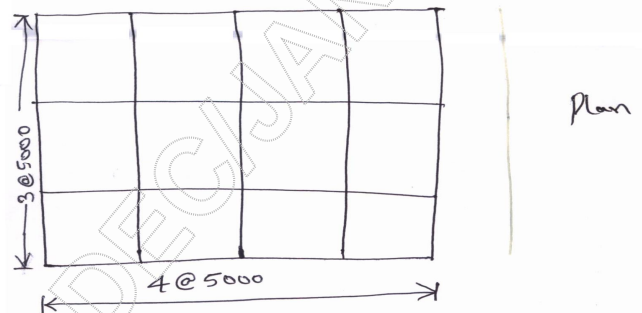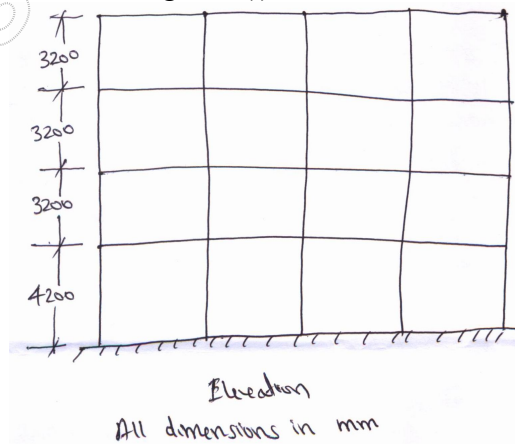
Fig. Q8 (ii)   (20 Marks)

Module-5

9   a. What are the ductile detailing provisions for the design columns as per IS code? Explain with neat sketches.   (10 Marks)
    b. Write a note on retro fitting of masonry and RCC buildings in secure seismic zone.
                                                       (10 Marks)

OR

10 a. Discuss the various methods to improve seismic behavior of masonry buildings.   (10 Marks)
    b. Explain the behavior of an reinforced masonry walls in the buildings as box action with suitable sketches.   (10 Marks)

* * * * *