

**B.TECH**  
**(SEM VIII) THEORY EXAMINATION 2018-19**  
**EARTHQUAKE RESISTANT DESIGN OF STRUCTURES**

Time: 3 Hours

Total Marks: 100

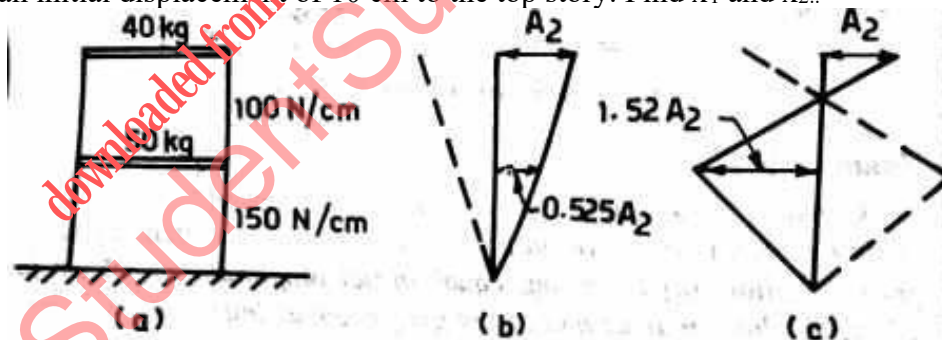
**Note:** Attempt all questions in any order and then choose suitably.

**SECTION A**

1. Attempt questions brief. 2 x 10 = 20
- Define earthquake resistant design philosophies.
  - What factors of earthquake forces in a structure ?
  - Define isoseismals of an earthquake.
  - What are the dynamic behavior of soil?
  - Define radiation damping.
  - List out methods of modeling soil.
  - Define spring models.
  - Write spring models limitation.
  - Define lap splices.
  - Define restrotation.

**SECTION B**

2. Attempt any three of the following: 10x3=30
- Describe types and characteristics of typical dynamic loading with examples and essential characteristics of dynamic problem.
  - What are the plate tectonics and how they are related to continental drift and sea floor spreading.
  - Consider a two storied structure shown in figure . Let the system be given free vibration by giving an initial displacement of 10 cm to the top story. Find  $x_1$  and  $x_2$ .



- What is response spectra and explain the importance of seismic design of a structure ?
- Describe the development of mass spring dashpot model from elastic half space theory.

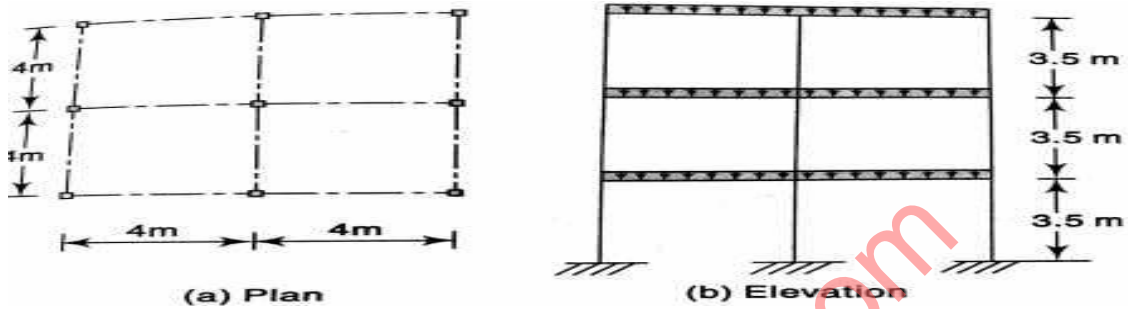
**SECTION C**

3. Attempt any one part of the following:
- Describe effects of earthquake. and also define moment magnitude.
  - Distinguish between the following (a) Body ways and surface ways (b) lithosphere and asthenosphere.
4. Attempt any one part of the following:
- An SDOF system consist of a mass with weight of 175 kg and a spring constant  $k=530$  kN/m . While testing the system a relative velocity of 30 cm/s was observed on application of a force of 450 N. Determine the damping ratio, damped frequency of vibration, logarithmic decrement, and the ratio of two consecutive amplitudes.

- b. Derive a mathematical expression defining the dynamic displacements using d'Alembert's principle.

**5. Attempt any one part of the following:**

- a. Describe the various earthquake –resistant features that can be introduced in a masonry building to make it earthquake resistant.
- b. The plan and elevation of a three – storied RCC building shown in figure . the building is located in seismic zone V. The type of soil encountered is medium stiff and is proposed to design the building with a special moment –resisting frame. The intensity of DL is  $10 \text{ kN/m}^2$  and the floors are to cater to an IL of  $3 \text{ kN/m}^2$ . Determine the design seismic loads on the structure by static analysis.



**6. Attempt any one part of the following:**

- a. Determine the frequency and design seismic coefficient for an ordinary masonry shear wall in a school building at Allahabad. For the given following data . Roof load  $P=15 \text{ kN/m}$ , Height of wall  $h=3.0 \text{ m}$  , Width of wall  $b=0.2 \text{ m}$  . Unit weight of wall  $w =19.2 \text{ kN/m}^2$ , soil is medium.
- b. Define bands. At what levels in a masonry building would you provide them? Give justifications for each of them

**7. Attempt any one part of the following:**

- a. Starting from fundamentals derive the expression for natural frequencies and amplitudes for block foundation subjected to horizontal forces  $F_x \sin \omega t$  and a moment  $M_y \sin \omega t$  at the combined center of gravity of machine and foundation.
- b. Determine the lateral forces on a two-storey unreinforced brick masonry building as shown in figure sustained near Zone III for following data . Plan size =  $18 \text{ m} \times 8 \text{ m}$  , total height of building =  $6.2 \text{ m}$  , storey height =  $3.1 \text{ m}$  , weight of roof =  $2.5 \text{ kN/m}^2$  , weight of wall =  $5 \text{ kN/m}^2$  , live load on roof =  $0$  , live load at floor =  $1.0 \text{ kN/m}^2$  Zone factor =  $1.0$  , importance factor =  $1.0$  , Response reduction factor =  $1.5$  , soil (Type III) medium soil.

