

**B.TECH.**

**THEORY EXAMINATION (SEM-VIII) 2016-17**

**EARTHQUAKE RESISTANT DESIGN**

**Time : 3 Hours**

**Max. Marks : 100**

**Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.**

**SECTION – A**

- 1. Explain the following:** **10 x 2 = 20**
- What are the different types of seismic wave?
  - Define epicenter.
  - State the dynamic degrees of freedom.
  - Name any three approaches for developing governing equation of a vibrating system.
  - Write the assumption are made to simply the analysis in modeling of structures
  - State the time history method.
  - What is response spectrum?
  - List any 2 typical features of damages due to earthquake in masonry buildings.
  - What are the requirements are prescribed by the Indian Code for web reinforcement?
  - Write the type of machine foundation.

**SECTION – B**

- 2. Attempt any five of the following questions:** **5 x 10 = 50**
- Discuss the theory of elastic rebound.
    - List the different types of seismic waves in detail.
  - Brief note on fault, dip and their role in formation of earthquake with neat sketch.
  - An SDOF system has a mass of 50kg, a damping ratio of 0.1, a natural frequency of 10rad/s and is subjected to a harmonic excitation of amplitude 2500N and frequency of 150rad/s. Determine the steady state amplitude and phase angle of the response.
  - List out and explain the various factors affecting the response of the building.
  - Describe the Hozler's numerical technique for determining natural periods of vibration for multi degree freedom system.
  - Detail the typical reinforcement arrangement for beam column joint of reinforced concrete buildings to have resistance to earthquake forces.
  - Explain the concept of response spectrum
  - Write the recommendations of IS code for detailing of RC beams for ductility in detail.
    - Discuss the behavior of masonry buildings during earthquakes including failure pattern.

**SECTION – C**

- Attempt any two of the following questions:** **2 x 15 = 30**
- Brief on causes of earthquake.
    - Derive the equation for single degree of freedom system for damped system. Hence draw the curve for displacement versus time for an over damped system.
  - Describe some typical types of damages and their causes in RC building during earthquakes.
    - Discuss the principle of capacity design for earthquake resistant design of structures.
  - Determine the natural frequencies and mode shape of the given MDOF system. The mass of 3000 kg, 4000 kg and 5000 kg act from top of the storey. Assume  $EI = 4.5 \times 10^6 \text{ N-m}^2$  for all columns.

