

(Please write your Exam Roll No.)

END TERM EXAMINATION

SEVENTH SEMESTER [B.TECH] NOVEMBER-DECEMBER 2018

Paper Code: ETCE-413

Subject: Earthquake Technology

Time: 3 Hours

Maximum Marks: 75

Note: Attempt all questions as directed. Internal choice is indicated.
Assume missing data suitably if not given.

Q1 Short answer type questions:-

- (a) Classify types of earthquake and various causes of earthquake? Explain in detail what are seismic waves and its types. (3+2)
- (b) Differentiate between soft storey and weak storey in a building. (5)
- (c) Derive dynamic equation of motion to discuss free vibration of viscous damped SDOF system. (5)
- (d) Discuss different methods of seismic analysis of a structure. (5)
- (e) What is the effect of an earthquake on non-structural components in a building? What measures should be considered for earthquake protection of horizontal and vertical projections of a building. (2+3)

Q2 Discuss different methods to quantify the size of an earthquake? Explain various methods for characterization of a strong motion. (12.5)

OR

Write short notes on:-

(2.5x5=12.5)

- (a) Iso-seismal map
- (b) Damping
- (c) Ground failures due to earthquake
- (d) D'Alembert's principle
- (e) Seismic zones

Q3 Write short notes on:-

(2.5x5=12.5)

- (a) Natural frequencies and Mode shapes
- (b) Stodola's method
- (c) Logarithmic decrement
- (d) Transmissibility ratio
- (e) Lumped mass model

OR

- (a) What is the effect of mass, stiffness and damping on structural vibration and their significance in dynamic equation of motion? (5)
- (b) A heavy table is supported by flat steel legs. Its natural period in lateral vibration is 0.5 sec. when a 25 kg plate is clamped to its surface; the natural period in lateral vibration lengthens to 0.75 sec. What are the mass and the effective lateral stiffness of the table? (2.5)
- (c) For a system with damping ratio ξ , determine the number of free vibration cycles required to reduce the displacement amplitude to 10% of the initial amplitude; for the initial velocity being zero. (5)

Q4 Discuss un-damped free vibration analysis of a MDOF system and explain the modal expansion theorem using orthogonality property of the mode shapes. For forced vibration analysis of a damped MDOF system, discuss "Mode-superposition Method" explaining different modal combination rules. (12.5)

P.T.O.

OR

What is the philosophy of earthquake resistant design and what are different code based methods of seismic design of structures? What are different types of lateral load resistant system? What are the IS code provisions for drift limitations in a building? (6.5+3+3)

- Q5 What do you understand by response control of a building? Categorically identify different methods of response control. Explain the importance of ductility in ERD of buildings (both steel and RCC buildings) as well as the IS code provisions for ductility requirements in the building. (2.5+5+5)

OR

Explain different levels of seismic evaluation of existing buildings. What are different types of irregularities in a building and their effect on seismic performance of the building? Explain various retrofitting techniques for seismic strengthening of existing buildings? (5+4+3.5)

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