Question Paper Code : 91316

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Seventh Semester

Civil Engineering

CE 6701 – STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING

(Regulations 2013)

(Also Common to PTCE 6701 – Structural Dynamics and Earthquake
Engineering for B.E. Part-Time Fifth Semester – Civil Engineering –
Regulations 2014)

Time : Three Hours   Maximum : 100 Marks

Answer ALL questions.

PART – A   (10×2=20 Marks)

1. Write the D'Alembert's principle of dynamic equilibrium.
2. Define logarithmic decrement method.
3. What is meant by multi degree of freedom system ?
4. Differentiate coupled and uncoupled equations of motion.
5. Define magnitude of earthquake.
6. Mention a few disastrous earthquakes that had occurred around the world.
7. What is the basis of Response spectrum theory ?
8. Define liquefaction.
9. What is meant by design horizontal seismic co-efficient ?
10. Write about base isolation technique.

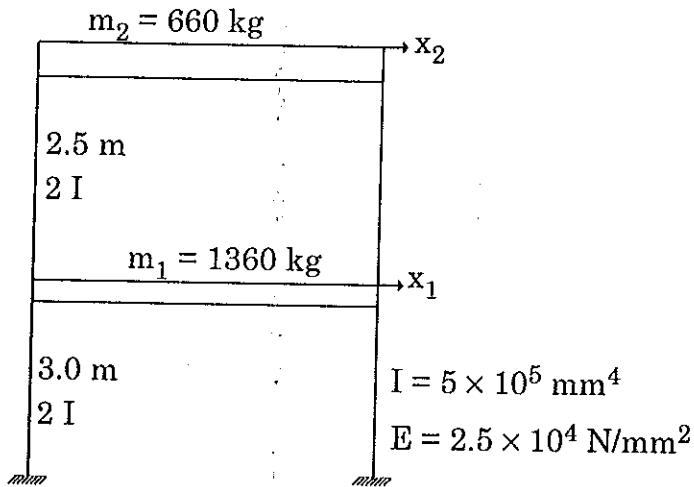PART – B   (5×13=65 Marks)

11. a) A vibrating system consisting of a weight of w = 50 N and a spring with stiffness
    of 4 N/mm is viscously damped. The ratio of two successive amplitudes is 1:0.85
    compute
    a) natural frequency (undamped) of the system.
    b) logarithmetic decrement.
    c) damping ratio.
    d) the damping coefficient and
    e) damped natural frequency.

(OR)

b) Derive the equation of motion of a single degree of freedom system for free
    vibration and find the solution for
    a) Underdamped system.
    b) Overdamped system.

12. a) Determine the natural frequencies and mode shapes of the structure shown in fig.

$m_2 = 660$ kg $\rightarrow x_2$

2.5 m

2 I

$m_1 = 1360$ kg $\rightarrow x_1$

3.0 m

2 I

$I = 5 \times 10^5$ mm^4

$E = 2.5 \times 10^4$ N/mm^2

(OR)

b) Derive orthogonality relation between the mode shapes of two degree of freedom system.

13. a) Explain in detail about Tectonic plate theory.

(OR)

b) Describe strong motion characteristics and elaborate its effects.

14. a) Enumerate the effect of earthquake on different types of structures with neat sketch.

(OR)

b) How will you construct a response spectrum diagram ? Enumerate the characteristics of response spectrum in detail.

15. a) What are the possible causes of damage in a building due to earthquake ?

(OR)

b) Explain the earthquake resistant design philosophy for buildings.

PART – C
(1×15=15 Marks)

16. a) A platform of weight 18 kN is being supported by four equal columns which are clamped to the foundation. Experimentally, it has been computed that a static force 5 kN applied horizontally, to the platform produces a displacement of 2.5 mm. It is estimated that the damping in the structure is of the order of 5% of critical damping. Compute the following : (a) Undamped natural frequency. (b) Damping coefficient. (c) Logarithmic decrement. (d) No. of cycles and time required for amplitude of motion to be reduced from an initial value of 2.5 mm to 0.25 mm.

(OR)

b) Define Seismic waves. Elaborate the types of seismic waves in detail with neat sketch.