

(4)

23732

23732

6. Derive expression for the damped single degree of freedom with the help of free body diagram. 20
7. (a) Explain step by step procedure of Holzer method? Derive fundamental natural frequencies and mode shapes? 10
- (b) Explain about the D' Alemberts principle with example. 10
8. Consider the uniform shear building in which the mass of each floor is m and the stiffness of each story is k . Determine the general form of the system of differential equations for a uniform shear building of N stories. 20

M.Tech. Civil Engineering (Computer aided Structural Engineering) 2nd Semester Examination, July-2022
STRUCTURAL DYNAMICS & EARTHQUAKE ENGG

Paper-21MTCASE22C2

Time allowed : 3 hours]

[Maximum marks : 100

Note : Attempt any five questions. All questions carry equal marks.

1. (i) Define the terms response spectrum.
- (ii) What is viscous damping?
- (iii) What is the formula for free vibration response?
- (iv) What are the specifications for shear detailing?
- (v) What is a critically damped system?
- (vi) What is simple Harmonic motion?
- (vii) What is the single degree of freedom system?
- (viii) What is accelerogram?
- (ix) What is meant by seismic waves?
- (x) Differentiate between continuous system and discrete systems. $2 \times 10 = 20$

[P.T.O.

23732-P-4-Q-8 (22)

23732

(2)

23732

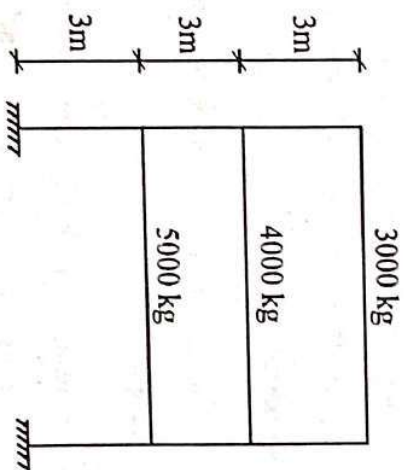
2. (a) A mass of 10 kg is supported by a steel wire 1 m in dia and 3 m long. The system is made 10 to move upwards with a uniform velocity of 10 cm/sec when the upper end is suddenly stopped. Determine the frequency and the amplitude of the resulting vibrations of the mass and the maximum stress on the wire. 10
- (b) State and prove orthogonality property of mode shapes. 10
3. A vibrating system consists of a mass of 5 kg, spring of stiffness 120 N/m and a damper with a damping coefficient of 5 N/s/m. determine
- (a) Damping factor
- (b) Natural frequency of the system
- (c) Logarithmic decrement
- (d) The ratio of two successive amplitude
- (e) The number of cycles after which the initial amplitude reduces to 25%. 20

23732

(3)

23732

4. Determine the natural frequency and mode shape for the MDOF system. $EI = 4.5 \times 10^6 \text{ N}\cdot\text{m}^2$ for all columns. 20



5. (a) A Harmonic motion has an amplitude of 0.05 m and a frequency of 25 Hz. Find the time period, maximum velocity and maximum acceleration. 10
- (b) A trailer being pulled by a truck moving at constant speed v is idealized as a mass m connected to the truck by a spring of stiffness k . Determine the governing equation and its solution if the truck starts from rest. 10

23732

[P.T.O.]