

B. Tech. (Civil Engineering) 8th Semester (G-Scheme)
Examination, July-2022
STRUCTURAL DYNAMICS

Paper- PEC-CEEL-414G

Time allowed : 3 hours [Maximum marks : 75]

Note: (1) *Question No.1 is compulsory.*

- (2) Each question carries equal mark (15 marks).
 - (3) Students have to attempt 5 questions in total at least **one** question from each
1. (a) What do you understand by degree of freedom?
 - (b) What is magnification factor?
 - (c) A harmonic motion has a time period of 0.2s and an amplitude of 0.4 cm. find the maximum velocity and acceleration.
 - (d) Discuss Dynamic load factor for various impulses.
 - (e) Explain Eigen values.
 - (f) Name a few methods for finding the fundamental natural frequency of a multi degree of freedom system.

$$6 \times 2.5 = 15$$

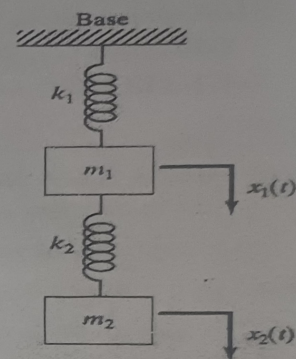
Section-A

2. (a) Discuss how structural dynamic problem differ from its static loading? What are the different types of vibration in a structural problem? 7.5

- (b) Explain principal and working of piezoelectric transducers. 7.5
3. (a) Derive the equilibrium equation for a free vibration of viscous damping of single degree freedom system. 7.5
- (b) A 20 kg mass attached to the lower end of a spring whose upper end is fixed, vibrated with a natural period of 0.6s. Determine the natural period when a 3 kg mass is attached to the mid-point of the same with the upper and lower end fixed. 7.5

Section-B

4. Derive the equation of motion for damped force vibrations with constant harmonic excitation of a single degree freedom system. 15
5. Find the natural frequencies of the system shown in Figure, with $m_1 = m_2 = m_3 = 2m$, $k_1 = k_2 = k_3 = 2k$. Determine the response of the system when $k = 1000$ N/m, $m = 20$ kg, and the initial values of the displacements of the masses m_1 and m_2 are 1 and -1, respectively. 15



Section-C

6. What do you mean by decoupling of equations? Explain the concept of modal superposition. 15
7. Explain consistent and lumped mass matrices. 15

Section-D

8. Explain in brief about the Rayleigh Ritz method of vibrational analysis. 15
9. Determine the response of spring mass damper system to a step input and plot the system response for different amounts of damping. 15