

Seventh Semester B.E. Degree Examination, July/August 2022

Mechanical Vibrations

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.

PART – A

- 1
 - a. What are the types of vibrations? Briefly explain. (06 Marks)
 - b. Explain the beats phenomenon and obtain its resultant motion. (07 Marks)
 - c. Obtain the periodic functions in terms of series of sines and cosines of a Fourier series. (07 Marks)

- 2
 - a. Find the natural frequency of a spring-mass system with considering mass of the spring. (10 Marks)
 - b. Calculate the natural frequency of a system shown in Fig Q2(b). Using Newton's law of motion.

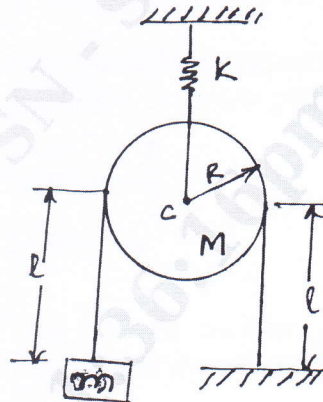


Fig Q2(b)

(10 Marks)

- 3
 - a. Discuss the underdamped system with derivation of response equations and curves. (12 Marks)
 - b. A vibrating system having a mass of 3kg, spring stiffness of 100N/m and damping coefficient of 3N-s/m. Determine the damping ratio, damped natural frequency, logarithmic decrement, ratio of two consecutive amplitudes and number of cycles after which the original amplitude is reduced to 20%. (08 Marks)

- 4
 - a. Analyse the forced vibration with constant harmonic excitation and obtain an equation in non-dimensional form. (10 Marks)
 - b. A vibrating body is supported by six isolators each having stiffness to 32000 N/m and six dashpots each have 400Ns/m. The vibrating body is to be isolated by a rotating device having an amplitude of 0.06mm and 600rpm. Take $m = 30\text{kg}$. Determine amplitude of vibration of the body and dynamic load on each isolator. (10 Marks)

PART – B

- 5 a. Explain the vibrometer and accelerometer with sketch. (10 Marks)
 b. Obtain an expression for whirling of shaft with air damping. (10 Marks)
- 6 a. Discuss the principle modes of vibration and natural frequencies of the system shown in Fig Q6(a). Assume $K_1 = K_2 = K_3 = \text{KN/m}$, $m_1 = m_2 = m \text{ kg}$.

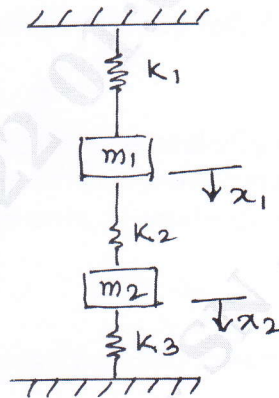


Fig Q6(a)

(12 Marks)

- b. Explain combined rectilinear and angular modes of systems with an expression. (08 Marks)
- 7 a. Calculate the influence coefficient of a dynamic system consisting of 3-equal masses attached to a string shown in Fig Q7(a).

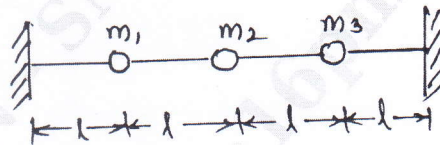


Fig Q7(a)

(08 Marks)

- b. Use the Stodola method to find the fundamental mode of vibration and its natural frequencies of system shown in Fig Q7(b)

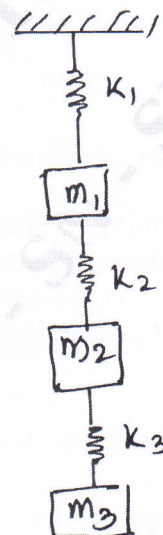


Fig Q7(b)

(12 Marks)

- 8 a. Discuss the basic methods of machine condition monitoring. (10 Marks)
 b. Explain the experimental modal analysis of modal parameters. (10 Marks)
