



K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

	InSem Examination-I Winter 2023		
	Exam Seat No.:		
	Academic Year:2023-2024	Semester: I	
	Name of Programme: M.Tech	Pattern: 2022	
	Name of Course: Structural Dynamics	Course Code:CIV225102	
	Max. Marks:30	Duration:1	

1. This question paper contains 02 page(s).
2. Answer to each new question is to be started on a new page.
1. Assume suitable data wherever required, but justify it.
2. Draw the neat labelled diagrams, wherever necessary.
3. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question

Question No. 1 Attempt following Question

- a) A portal frame with one end fixed and other free, of height 4m and span 7m. Rigid beam of the portal supports total UDL 5kN/m. M.I. for a column section is $6.7 \times 10^{-5} \text{ m}^4$, $E=2 \times 10^5 \text{ N/m}^2$. Find natural frequency. (5) CO 1, CO 3

OR

- b) Starting from fundamentals, obtain the governing equation for the motion of an undamped SDOF system under free vibrations. (5) CO 1, CO 3

- c) What is viscous damping?

Obtain the governing equation for the motion of an underdamped SDOF system subjected to free vibrations, assuming the damping as Viscous. Draw the nature of response. (10) CO 1, CO 3

OR

- d) Derive the response equation for a system subjected to undamped harmonic excitations. Explain steady state response, transient response & total response graphically. (10) CO 1, CO 3

Question No. 2 Attempt following Question

- a) Explain Half Power Bandwidth Method with neat sketch (5) CO 1, CO 3

OR

- b) Explain harmonic loading and impulsive loading with suitable examples. (5) CO 1, CO 3

- c) A structure is modeled as a damped oscillator with spring constant $k = 6000 \text{ kN/m}$ and undamped natural frequency 40 rad/sec . Experimentally it was found that a force 5000 N produced a relative velocity of 0.03 m/s in the damping element. Find a) damping ratio, b) logarithmic decrement, c) damped period, d) the ratio between consecutive amplitudes. (10) CO 1, CO 3

OR

- d) Explain the term Transmissibility, Derive the equation of transmissibility where the support of the simple oscillator is subjected to a harmonic motion $u_s(t) = u_0 \sin \omega t$ (10) CO 1, CO 3