



**K. K. Wagh Institute of Engineering Education & Research, Nashik**  
(An Autonomous Institute From A.Y. 2022-23)

| WINTER-2024                         |                     |
|-------------------------------------|---------------------|
| Exam Seat No.:                      |                     |
| Academic Year:2024-2025             | Semester:I          |
| Class:PG-I                          | Program: FY. M.Tech |
| Branch Code: CIV                    | Pattern:2024        |
| Name of Course: Structural Dynamics | Course Code:2404502 |
| Max. Marks:60                       | Duration: 2.50 Hrs. |

**Instructions:** Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

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

**Marks CO**

**Question No. 1**

- 1a) What is viscous damping? Obtain the governing equation for the motion of over damped SDOF system subjected to free vibrations. Draw the nature of response. (6) CO1

**Question No. 2**

- 2a) Explain steady state response, transient response & total response graphically. (6) CO1

**Question No. 3**

- 3a) Define Response Spectrum. Elaborate construction of Response Spectrum in general. (8) CO2, CO3

**OR**

- 3b) Using Duhamel's integral, determine the response of an undamped system to a Triangular pulse force of initial Magnitude  $P_0$  and duration  $t_d$ . (8) CO2, CO3

- 3c) Using Duhamel's integral, determine the response of an undamped system to a rectangular pulse force of Magnitude  $P_0$  and duration  $t_d$ . (8) CO2, CO3

**OR**

- 3d) Elaborate Numerical evaluation of Duhamel's Integral for undamped system. (8) CO2, CO3

**Question No. 4**

- 4a) Elaborate Non linear analysis by constant acceleration method. (8) CO3, CO4

**OR**

- 4b) Derive stiffness formulation of the equations of motion for a three storey shear building. (8) CO3, CO4

- 4c) Write a short note on Non linear Analysis using Wilson Theta. (8) CO3, CO4

**OR**

- 4d) Derive Orthogonality Property of the Normal Modes for two DOF system. (8) CO3, CO4

**Question No. 5**

- 5a) Provide solution of equation of motion under free vibrations for a simply supported beam. (8) CO3, CO4

**OR**

- 5b) Explain design and planning considerations of machine foundations. (8) CO3, CO4
- 5c) Derive an expression for natural frequency of simply supported beam. Also evaluate first five natural frequencies. (8) CO3, CO4

**OR**

- 5d) State types of Passive Energy dissipation systems. Elaborate any two passive control systems for practical use. (8) CO3, CO4

**..... End of question paper.....**