

Time: 3 Hours

Marks: 80

Note :

- Question No.1 is compulsory.
- Solve ANY THREE questions from the **remaining** five questions.
- Figure to the right indicates full marks.
- Assume suitable data wherever required, but justify the same.

Marks

- Q. 1** Solve ANY FOUR questions from following. (Each question carries 5 marks)
- a) Classify the vibration control (5)
 - b) Explain a dynamic vibration absorber (5)
 - c) Discuss Resonance Detuning and Decoupling. (5)
 - d) Discuss need and basic scheme of Adaptive Vibration Absorber. (5)
 - e) Explain the difference between passive and active isolation. (5)
 - f) Explain the sources of industrial vibration.
- Q. 2**
- a) A structure supporting a rotating machine is found to vibrate excessively at an excitation frequency of 18 Hz. It is proposed to attach a vibration neutralizer tuned to this frequency . What should be the mass and stiffness of the neutralizer so that the resulting two natural frequencies are at least 20% away from the excitation frequency? The supporting structure has an effective mass of 1000 kg and a natural frequency of 16 Hz. (12)
 - b) Derive the stiffness of single acting air spring. (08)
- Q. 3**
- a) Explain vibration isolation system with base motion. (10)
 - b) Discuss ground hook control method for Semi-Active tuned vibration absorber. (10)
- Q. 4**
- a) Discuss Quarter-Car model of a Vehicle Suspension. (10)
 - b) A 50-kg mass is subjected to the harmonic force $F(t) = 1000 \cos 120t$ N. (10)
Design an undamped isolator so that the force transmitted to the base does not exceed 5% of the applied force. Also, find the displacement amplitude of the mass of the system with isolation.

- Q. 5** a) Write a short note on Magnetorheological (MR) fluids and explain its different models in dampers. (10)
- b) An electronic instrument is to be isolated from a panel that vibrates at frequencies ranging from 25 Hz to 35 Hz. It is estimated that at least 80 percent vibration isolation must be achieved to prevent damage to the instrument. If the instrument weights 85 N, find the necessary static deflection of the isolator. (10)
- Q. 6** a) Discuss ground hook control method for Semi-Active tuned vibration absorber. (10)
- b) Explain the effect of undamped vibration absorber on the response of machine. (10)
