



- Notes :
1. All questions carry equal marks.
 2. Due credit will be given to neatness and adequate dimensions.
 3. Assume suitable data wherever necessary.
 4. Diagrams and Chemical equation should be given wherever necessary.
 5. Illustrate your answers wherever necessary with the help of neat sketches.
 6. Discuss the reaction, mechanism wherever necessary.
 7. Answer **any five** questions.

1. a) Explain vibration isolation for two plane symmetrical system and it's free body diagram. 7
 b) Explain terms related to vibration (a) Force vibration (b) Free or natural vibration 7
 (c) Damped vibration (d) Longitudinal vibration.
2. A cantilever shaft 50 mm diameter and 300 mm long has a disc of mass 100 kg at its free end. The Young's modulus for the shaft material is 200 kN/m^2 determine the frequency of a cantilever shaft 50 mm diameter and 300 mm long has a disc of mass 100 kg at its free. 14
3. A gun barrel of mass 600 kg has a recoil spring of stiffness $294,000 \text{ N/m}$. If the barrel recoils 1.3 meters on firing. Determine (a) The initial recoil velocity of the barrel (b) The critical damping coefficient of the dashpot which is engaged at the end of the recoil stroke. (c) The time required for the barrel to return to a position of 5 cm from the initial position. 14
4. a) Derive vibration due to excitation of the support to arbitrary periodic excitation. 7
 b) Explain multi degree freedom system by matrix formulation. 7
5. a) Deduce the Matrix formulation of effective stiffness of multi degree of freedom system and write characteristics of concerned matrix. 7
 b) Write the differential equations of motion in matrix form in terms of stiffness matrix. 7
6. a) Explain orthogonal properties of the normal modes. 7
 b) Explain in brief the continuous system of longitudinal vibration of Bars. 7
7. A bar fixed at one end is pulled at the other end with a force P. The force is suddenly released investigate the vibration of bar. 14
8. A device used to measure torsional acceleration consists of a ring having a moment of inertia 0.049 kg/m^2 connected to a shaft by a spiral spring having a scale of 0.98 Nm/rad . A viscous damper having a constant of a 0.11 Nm-sec/rad , when the shaft vibrates with a frequency of 15 rpm, the relative amplitude between the ring and the shaft is found to be 2 degree, what is the max. acceleration of the shaft. 14
