

PART B — (5 × 16 = 80 marks)

11. (a) A block of weight 900 N (moving between vertical guides) is supported by a spring of stiffness 10^6 N/m. The block is given an initial displacement of 50 mm with a velocity of 300 mm/sec, determine the period of vibration, natural frequency, amplitude of motion, maximum velocity and maximum acceleration of the block. Assuming a damping of 20% determine the logarithmic decrement and the damping coefficient of the system. (16)
- Or
- (b) (i) A machine of 200 kg mass is supported on four parallel springs of total stiffness 750 N/m has a unbalanced rotating component which result in a disturbing force of 350 N at a frequency of 2121 rpm. If damping ratio is 0.2, determine:
(1) Amplitude of motion due to the unbalance,
(2) Transmissibility,
(3) Transmitted force. (3 × 4 = 12)
- (ii) Write short notes on Coulomb damping. (4)
12. (a) Obtain the natural frequencies and the mode shapes for a single bay two storey shear frame with combined stiffness of ground and first floor columns as $k=2000$ kN/m and 1000 kN/m respectively. Mass of each floor is 2000 kg. (16)
- Or
- (b) Derive an expression for the free vibration of a damped two degree of freedom system. (16)
13. (a) (i) Neatly tabulate and elaborate the details of MSK intensity scale. (12)
(ii) Classify earthquakes based on focal depth and magnitude. (4)
- Or
- (b) (i) Write short notes on the lesson learnt from recently occurred earthquake. (8)
(ii) Write short notes on the following,
(1) Elastic rebound theory (4)
(2) Body waves and surface waves. (4)
14. (a) How will you construct response spectrum diagram. Explain the types of response spectrum with neat sketches. (16)
- Or
- (b) Briefly discuss with neat sketches about the plan irregularities and vertical irregularities normally occurred in buildings. (16)
15. (a) Write short notes on
(i) Capacity design, (8)
(ii) Techniques of aseismic design. (8)
- Or
- (b) Write short notes on :
(i) Base isolation system. (6)
(ii) Passive energy dissipation system. (6)
(iii) Active control system. (4)