[Time : 3 Hours]   [Total Marks : 80]

N.B : 1. Question No. 1 is compulsory.
2. Attempt any three questions from remaining.
3. Use suitable diagram whenever necessary.
4. Assume suitable diagram whenever required & mention clearly.

1. (a) Explain the terms effort and power of a porter governor.   4
   (b) Write a note on stability of an automobiles.   4
   (c) Explain the vibration paramter with neat sketch.   4
   (d) Explain the terms :   4
       (i)   Damping ratio
       (ii) Logarithmic decrement
       (iii) Coulomb damping
   (e) Explain the following terms :   4
       (i) Magnification factor
       (ii) Vibration isolators.

2. (a) Each Arm of a porter governor is 250mm long and is pivoted on the axis of rotation. 10
       The mass of each ball is 5kg and the sleeve is 25kg. The sleeve begains to raise
       when the radius of rotation of the ball is 150 mm & reaches the top when it is
       200mm.
       Determine the range of speed, Lift of sleeve, governor effort and power. In what
       way are these values changed if friction at the sleeve is equivalent to 10N ?
   (b) Find the natural frequency of the system shown in Fig :1   6
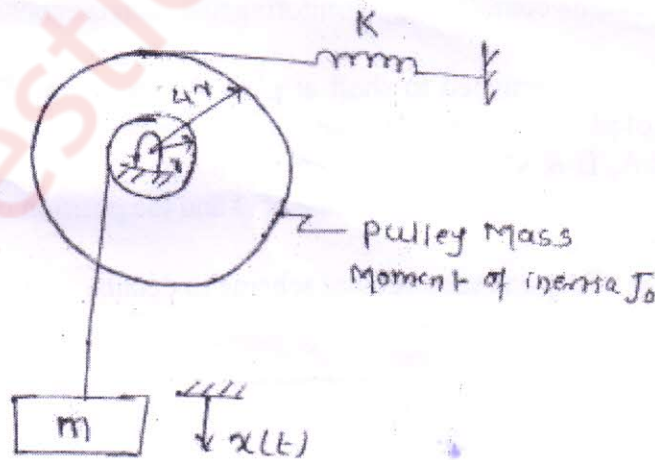

Fig :1

   (c) A spring-mass system has spring stiffness K N/m and a mass of M kg. It has 4
       natural freqency of vibration of 12Hz. An extra 2kg mass is coupled to M and the
       natural frequency reduced by 2Hz. Find K & M.

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3. (a) Explain in details step involved in vibration analysis. 8

   (b) A refrigerator unit having a mass of 35kg is to be supported on 3 spring, each 6
   having stiffness K The unit operates at 480 rpm. Find the value of K, if only10%
   of the shaking force is allowed to be transmitted to the supporting structure.

   (c) Explain basic principle of vibrometer with neat sketch. 6

4. (a) The turbine rotor of a ship has a mass of 2000kg and rotates at a speed of 3000 10
   rpm. Clockwise when looking from a stern. The radius of gyration of the rotor is
   0·5m. Determine the gyroscopic couple and its effect upon the ship when the ship
   is steering to the right in a curve of 100 m radius at a speed of 16·1 knots
   (1knot = 1855m/hr. Calculate also the torque & its effect when the ship is pitching
   in simple harmon is motion, the bow falling with is maximum velocity.The period
   of pitching is 50 seconds and the total anglar displacement between the two extreme
   position is 12°. Find the maximum accleration during pitching motion.

   (b) A single cylinder vertical petrol engine of total mass 320 kg is mounted upon a 10
   steel chassis frame & cause a vertical static deflection of 0·2 cm. The reciprocating
   parts of the engine have a mass of 24 kg and move through a vertical stroke of
   15cm with S.H.M. A dashpot is provided, the damping resistance of which is
   directly proportional to the velocity and amounts to 490 N at 0·3m/s Determine.

      (i) the speed of the driving shaft at which resonance will occurs, and

      (ii) the amplitude of steady state forced vibration when the driving shaft of
   the engine rotates at 480 r.p.m.

5. (a) A vibrating system consist of a mass of 7 kg, a spring of stiffness 50 N/cm and 10
   damper of damping coefficient 0·3N sec/cm. Find the damping factor, the
   logarithmic decrement and ratio of any two successive amplitude.

   (b) Explain machine conditioning monitoring and fault diagnosis of rotating masses. 10

6. (a) Four masses are attached to shaft at planes A, B, C and D at equal radii. The 12
   distances of planes B, C and D from A are 50cm, 60cm & 130cm respectively, the
   masses at A, B & C are 60kg, 55kg and 80kg respectively. If the system is in
   complete balance determine the mass at D and the position of masses B, C and D
   with respect A.

   (b) Explain the vibration measurement scheme in details. 8

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