Reg. No. : | | | | | | | | | | |

Question Paper Code: 45701

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2020

Fifth Semester

Mechanical Engineering

14UME501 - DYNAMICS OF MACHINERY

(Regulation 2014)

Duration: 1.15 hrs Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

(Answer any six of the following questions)

1. In Reciprocating engine primary forces

   (a) are completely balanced (b) are partially balanced
   (c) are balanced by secondary force (d) cannot be balanced

2. A System of masses rotating in different parallel planes is in dynamic balance if the resultant

   (a) Force is equal to zero
   (b) Couple is equal to zero
   (c) Force and the resultant couple are both equal to zero
   (d) Force is numerically equal to the resultant couple but neither of then need necessarily be zero

3. Balancing of a rigid rotor can be achieved by appropriately placing balancing weights in

   (a) Single plane (b) Two plane (c) Three plane (d) Four plane

4. For balancing a single disturbing mass, the minimum number of balance mass required to be introduced in a plane parallel to the plane of rotation of the disturbing mass will be

   (a) Single plane (b) Two plane (c) Three plane (d) Four plane

5. The rotating shafts tend to vibrate violently at whirling speeds because

   (a) The system is unbalanced
   (b) Bearing centre line coincides with the axis
   (c) The shafts are rotating at very high speeds
   (d) Resonance is caused due to the heavy mass of the rotor

6. During transverse vibrations, shaft is subjected to which type of stresses?

   (a) Tensile stresses (b) Torsional shear stress
   (c) Bending stresses (d) none of these

7. Magnification factor is the ratio of

   (a) zero frequency deflection and amplitude of steady state vibrations
   (b) amplitude of steady state vibrations and zero frequency deflection
   (c) amplitude of unsteady state vibrations and zero frequency distribution
   (d) none of these

8. Rotating shafts tend to of vibrate violently at whirling speeds because

   (a) the shaft are rotating at vary speeds
   (b) Bearing centerline coincide with the shaft axis
   (c) the system is un balanced
   (d) Resonance is caused due to the heavy weight of the rotor

9. A Porter governor has a maximum and minimum equilibrium speeds of 200 rpm and 150 rpm respectively. If the effective load on the sleeve is 30 kgf, the governor effort would be

   (a) 1.67 kgf (b) 5.83 kgf (c) 7.5 kgf (d) 10.0 kgf

10. The rotor of a ship rotates in clockwise direction when viewed from the stern and the ship takes a left turn. The effect of the gyroscopic couple acting on it will be

    (a) to raise the bow and stern
    (b) to lower the bow and stern
    (c) to raise the bow and lower the stern
    (d) to lower the bow and raise the stern

PART – B (3 x 8= 24 Marks)

(Answer any three of the following questions)

11. The obliquity ratio of a vertical reciprocating engine is 4. The engine bore and the crank radius are 60 mm and 40 m respectively. The mass of the reciprocating parts is 1 kg. The difference in the gas pressure acting on the two sides of the piston is 5 bar, and the effective gas pressure acts downwards, towards the crank shaft, when the crank has moved 50^0 from the top dead centre position. Determine when crank speed=2000 rpm.

(i) The piston effort

(ii) The loads on gudgeon pin and the crank pin

(iii) The cylinder wall thrust and the thrust on the crank bearing. Neglect the inertia of the connecting rod (8)

12. Four masses A,B,C and D are completely balanced. Masses C and D make angle of 90° and 195° respectively with that of mass B in the counter- clockwise direction. The rotating masses have following properties: m_b = 25 kg, m_c = 40 kg, m_d = 35 kg, r_a =150 mm, r_b = 200 mm, r_c = 100 mm, r_d = 180mm. Planes B and C are 250 mm apart. Determine (i) the mass A and its angular position with that of mass B (ii) the position of all the planes relative to plane of mass A. (8)

13. A machine of mass 75 *kg* is mounted on springs and is fitted with a dashpot to damp out vibrations. There are three springs each of stiffness 10 *N/mm* and it is found that the amplitude of vibration diminishes from 38.4 *mm* to 6.4 *mm* in two complete oscillations. Assuming that the damping force varies as the velocity, determine: (i) The resistance of the dashpot at unit velocity; (ii) The ratio of the frequency of the damped vibration to the frequency of the undamped vibration; and (iii) The periodic time of the damped vibration. (8)

14. A machine of mass 75 kg is mounted on springs of stiffness 12×10^5N/m and with an assumed damping factor of 0.2. A piston within the machine of mass 2 kg has a reciprocating motion with a stroke of 80 mm and a speed of 3000 cycles/min. Assuming the motion to be simple harmonic, find (i) the amplitude of motion of the machine, (ii) its phase angle with respect to existing force, (iii) the force transmitted to the foundation, and (iv) the phase angle of transmitted force with respect to the existing force, and (v) the phase lag of transmitted force with respect to the applied force. (8)

15. Each arm of a Porter governor is 250 mm long. The upper and lower arms are pivoted to links of 40 mm and 50 mm respectively from the axis of rotation. Each ball has a mass of 5 kg and the sleeve mass is 50 kg. The force of friction on the sleeve of the mechanism is 40 N. Determine the range of speed of the governor for extreme radii of rotation of 125 mm and 150 mm. (8)

45701

45701

45701