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Question Paper Code: 35701

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

Fifth Semester

Mechanical Engineering

01UME501 - DYNAMICS OF MACHINERY

(Regulation 2013)

Duration: 1.15 hrs

Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

(Answer any six of the following questions)

- In Reciprocating engine primary forces
 - are completely balanced
 - are partially balanced
 - are balanced by secondary force
 - cannot be balanced
- A System of masses rotating in different parallel planes is in dynamic balance if the resultant
 - Force is equal to zero
 - Couple is equal to zero
 - Force and the resultant couple are both equal to zero
 - Force is numerically equal to the resultant couple but neither of them need necessarily be zero
- Balancing of a rigid rotor can be achieved by appropriately placing balancing weights in
 - Single plane
 - Two plane
 - Three plane
 - Four plane
- 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
 - Single plane
 - Two plane
 - Three plane
 - 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

(Answer any three of the following questions)

11. A horizontal steam engine running at 120 *rpm*, has a bore of 250 *mm* and stroke of 400 *mm*. The connecting rod is 0.6 *m* and mass of the reciprocating parts is 60 *kg*. When the crank has turned through an angle of 45° from the inner dead centre, the steam pressure on the cover end side is 550 *kN/m²* and that on the crank end side is 70 *kN/m²*. Considering the diameter of the piston rod equal to 50 *mm*, determine: turning moment on the crank shaft, thrust on the bearing and acceleration of the flywheel, if the power of the engine is 20 *kW*, mass of the flywheel 60 *kg* and radius of gyration 0.6 *m*. (8)
12. A shaft carries four masses *A*, *B*, *C* and *D* of magnitude 200 *kg*, 300 *kg*, 400 *kg* and 200 *kg* respectively and revolving at radii 80 *mm*, 70 *mm*, 60 *mm* and 80 *mm* in planes measured from *A* at 300 *mm*, 400 *mm* and 700 *mm*. The angles between the cranks measured anticlockwise are *A* to *B* 45°, *B* to *C* 70° and *C* to *D* 120°. The balancing masses are to be placed in planes *X* and *Y*. The distance between the planes *A* and *X* is 100 *mm*, between *X* and *Y* is 400 *mm* and between *Y* and *D* is 200 *mm*. If the balancing masses revolve at a radius of 100 *mm*, find their magnitudes and angular positions. (8)
13. Derive the expression for various damping conditions in a free vibration. (8)
14. A coil of spring stiffness 4 *N/mm* supports vertically a mass of 20 *kg* at the free end. The motion is resisted by the oil dashpot. It is found that the amplitude at the beginning of the fourth cycle is 0.8 times the amplitude of the previous vibration. Determine the damping force per unit velocity. Also find the ratio of the frequency of damped and undamped vibrations. (8)
15. Derive the expression for the lift of the porter governor considering friction between the sliding parts. (8)