

DYNAMICS OF MACHINE AND VIBRATIONS (MEE-S301)

Semester: 2023-24 (Odd Semester)

Year: 3rd Year (2K21)

Mid-2 Semester Examination

Time: 1.5 h

Maximum marks: 30

All questions are compulsory

Section A

9 marks (9 questions of 1 mark each)

1. In reference to dynamic balancing of a rotating masses system which statement is not true?
 - (a) If the system is statically balanced, it is dynamically balanced also
 - (b) If the system is dynamically balanced, it is statically balanced also
 - (c) The resultant couple due to all the inertia force during
 - (d) The center of mass of the system lies on the axis of rotation.
2. In case of reciprocating masses, secondary unbalanced force
 - (a) half
 - (b) one third
 - (c) n times
 - (d) times of the amplitude of primary unbalanced force, where $n = L / r$, where L = length of connecting rod and r is the length of crank.
3. If the propeller of an aeroplane rotates clockwise when viewed from the rear and the aeroplane takes a right turn, the gyroscopic effect will
 - (a) Tend to raise the tail and depress the nose
 - (b) Tend to raise the nose and depress the tail
 - (c) Tilt the aeroplane about spin axis
 - (d) Have no effect
4. If the axes of the rolling of the ship and of the stabilizing rotor are parallel, it will result in
 - (a) A higher bow and lower stern
 - (b) A lower bow and higher stern
 - (c) Turning towards left
 - (d) No gyroscopic effect
5. Static balancing involves balancing of
 - (a) forces
 - (b) couples
 - (c) forces as well as couples
 - (d) masses
6. If the propeller of an aeroplane rotates clockwise when viewed from the rear and the aeroplane takes a right turn, the gyroscopic effect will
 - (a) Tend to raise the tail and depress the nose
 - (b) Tend to raise the nose and depress the tail
 - (c) Tilt the aeroplane about spin axis
 - (d) Have no effect

7. For a single cylinder reciprocating engine speed is 500 rpm, stroke is 150 mm, mass of reciprocating parts is 21 kg, mass of revolving parts is 15 kg at crank radius. If two-thirds of reciprocating masses and all the revolving masses are balanced, the mass at a radius of 150 mm will be
 (a) 7.5 kg (b) 10.5 kg (c) 12.5 kg (d) 14.5 kg
8. Lists the different types of governor.
9. Difference between static and dynamic balancing.

Section B

9 marks (3 questions of 3 marks each)

1. Derive the expression of relationship between height of governor and speed of spindle in porter governor.
2. Write a brief notes on static balancing and dynamic balancing.
3. Derive the expression of gyroscopic couple.

Section C

12 marks (2 questions of 6 marks each, Each question can have parts)

1. The rotor has the following properties:

$$m_1 = 3 \text{ kg}, \quad r_1 = 30 \text{ mm} \quad \theta_1 = 30^\circ$$

$$m_2 = 4 \text{ kg}, \quad r_2 = 20 \text{ mm} \quad \theta_2 = 120^\circ$$

$$m_3 = 2 \text{ kg}, \quad r_2 = 25 \text{ mm} \quad \theta_2 = 270^\circ$$

Find the amount of the counter mass at a radial distance of 35 mm for the static balance.

- 2a. The turbine rotor of a sea vessel having a mass of 950 kg rotates at 1200 rpm clockwise while looking from the stern. The vessel pitches with an angular velocity of 1.2 rad/s. What will be the gyroscopic couple transmitted to the hull when the bow rises? The radius of gyration of rotor is 300 mm.
- 2b. A single cylinder reciprocating engine has a reciprocating mass of 60 kg. The crank rotates at 60 rpm and the stroke is 320 mm. Mass of the revolving parts at 160 mm radius is 40 kg. If two-thirds of the reciprocating parts and the whole of the reciprocating parts and the whole of the revolving parts are to be balanced, determine the balance mass required at a radius of 350 mm.