

Roll No



**PRESIDENCY UNIVERSITY
BENGALURU**

SET B

**SCHOOL OF ENGINEERING
END TERM EXAMINATION - JAN 2024**

Semester : Semester V - 2021

Course Code : MEC4004

Course Name : Dynamics of Machines

Program : B.Tech.

Date : 11-JAN-2024

Time : 9:30AM - 12:30 PM

Max Marks : 100

Weightage : 50%

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and non-programmable calculator are permitted.
- (iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS

5 X 2M = 10M

1. Define Piston effort. (CO1) [Knowledge]
2. What is an Applied Force? (CO1) [Knowledge]
3. Define Mean speed of flywheel. (CO2) [Knowledge]
4. Define steering in ships (CO3) [Knowledge]
5. What is a swaying couple? (CO4) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS

5 X 10M = 50M

6. Mohith is a senior consultant at Mahindra Research Valley, Chennai and has developed the relations for maximum Angular Acceleration for the Connecting rod of a 1.5 L single cylinder Engine. Assume the parameters and derive the relation for Angular Acceleration. (CO1) [Comprehension]
7. Volvo Eicher Commercial Ltd. have their Production plant at Pithampur, Indore. The Company wants to reduce the total fluctuation in energy for their product Volvo 9400. Suggest a solution for it and establish a relationship for solution in terms of Moment of inertia, mean speed. (CO2) [Comprehension]

8. Airbus A-320 is a globally accepted passenger aircraft. If the Aircraft is flying from Delhi to Bhopal and engine is rotating in clockwise direction (when seen from rear). The Aircraft Engineer wants to identify the effect of Different forces due to engine rotation while aircraft is taking a left turn. Assuming suitable parameters suggest the effect of Gyroscopic couple on the aircraft.

(CO3) [Comprehension]

9. Boeing 747 is a globally accepted passenger aircraft. If the Aircraft is flying from Bangalore to Hyderabad and engine is rotating in clockwise direction (when seen from rear). The Aircraft Engineer wants to identify the effect of Different forces due to engine rotation while aircraft is taking a right turn. Assuming suitable parameters suggest the effect of Gyroscopic couple on the turning in aircraft.

(CO3) [Comprehension]

10. Eicher motors is based in Pithampur, India and wants to conduct the analysis of a 7000 cc internal combustion engine at Pithampur plant. As design Engineer help the company to reach the expression for Gyroscopic couple by assuming suitable data.

(CO4) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS

2 X 20M = 40M

11. Consider A ship propelled by a turbine rotor which has a mass of 5 tonnes and a speed of 2000 r.p.m. The rotor has a radius of gyration of 0.70 m and rotates in a clockwise direction when viewed from the stern. Find the gyroscopic effects in the following conditions:
1. The ship sails at a speed of 40 km/h and steers to the left in a curve having 80 m radius.
 2. The ship pitches 6 degree above and 6 degree below the horizontal position. The bow is descending with its maximum velocity. The motion due to pitching is simple harmonic and the periodic time is 40 seconds.
 3. The ship rolls and at a certain instant it has an angular velocity of 0.08 rad/s clockwise when viewed from stern. Determine also the maximum angular acceleration during pitching. Explain how the direction of motion due to gyroscopic effect is determined in each case

(CO3) [Application]

12. Consider any 4 rotating masses say A, B, C and D are four masses carried by a rotating shaft at radii 100, 125, 200 and 150 mm respectively. The planes in which the masses revolve are spaced 300 mm apart and the mass of B, C and D are 10 kg, 6 kg, and 3 kg respectively. Find the required mass A and the relative angular settings of the four masses so that the shaft shall be in complete balance.

(CO4) [Application]