Course Code: 2050319 Roll No: **MLRS-R20**

MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
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III B.Tech I Sem Regular End Examination, December 2022

Dynamics of Machinery

(Mechanical)

Time: 3 Hours. **Max. Marks: 70**

Note: 1. Question paper consists: Part-A and Part-B.
2. In Part – A, answer all questions which carries 20 marks.
3. In Part – B, answer any one question from each unit.
Each question carries 10 marks and may have a, b as sub questions.

PART- A

(10*2 Marks = 20 Marks)

1.	a)	What is gyroscopic torque?	2M	CO1	BL1
	b)	Write the effect of precession motion on the stability of moving vehicles?	2M	CO1	BL1
	c)	Distinguish between static force and inertia force	2M	CO2	BL2
	d)	Explain the need for Dynamic force analysis	2M	CO2	BL4
	e)	What is the function of governor?	2M	CO3	BL1
	f)	Define the sensitiveness of a governor.	2M	CO3	BL1
	g)	What is meant by Hammer blow ?	2M	CO4	BL1
	h)	Explain the terms "primary and secondary distributing force"	2M	CO4	BL4
	i)	How vibrations are classified.	2M	CO5	BL1
	j)	Define degree of freedom in Vibrating systems?	2M	CO5	BL1

PART- B

(10*5 Marks = 50 Marks)

2	The turbine rotor of a ship has a mass of 20 tonnes and a radius of gyration of 0.75 m. Its speed is 2000 r.p.m. The ship pitches 60 above and below the horizontal position. One complete oscillation takes 18 seconds and the motion is simple harmonic. Determine (a) the maximum couple tending to shear the holding down bolts of the turbine. (b) The maximum angular acceleration of the ship during pitching and (c) The direction in which the bow will tend to turn while rising, if the rotation of the rotor is clockwise when looking from rear.	10M	CO1	BL3

OR

3	An aeroplane makes a half circle of 100 m radius towards left when flying at 400 kmph. The engine and propeller of plane weigh 500 kg, and have a radius of gyration of 30 cm. The engine rotates at 3000 rpm (ccw), when viewed from the front end. Find the gyroscopic couple.	10M	CO1	BL3

4	Draw and explain the free body diagrams of all the members of a four bar mechanism.	10M	CO2	BL4
	OR			
5	For a reciprocating engine, prove that the displacement, velocity and acceleration of the piston are given respectively by the expressions: $\text{Displacement} = x_p = r\left[(1-\cos\theta) + \left(n - \sqrt{(n^2 - \sin^2\theta)}\right.\right.$ $\text{Velocity} = V_p = \omega r\ \{\sin\theta + \frac{\sin 2\theta}{2n}\}$ $\text{Acceleration} = \alpha_p = \omega^2 r\ \{\cos\theta + \frac{\cos 2\theta}{n}\}$	10M	CO2	BL3
6	A loaded porter governor has 4 links upper & lower each 250mm long, the mass of each ball is 3kg and a central mass of 20kg neglect the friction at sleeve, the all arms are pivoted at a distance of 40mm from the axis of rotation. The radii of rotation are 150mm for minimum speed & 200 mm for maximum speed. Determine the range of speed.	10M	CO3	BL3
	OR			
7	A simple band brake is operated by a lever of length 450 mm. The brake drum has a diameter of 600 mm, and the brake band embraces 5/8 th of the circumference. One end of the band is attached to the fulcrum of the lever while the other end is attached to a pin on the lever 120 mm from the fulcrum. The effort applied to the end of the lever is 2 kN, and the coefficient of friction is 0.30. Find the maximum braking torque on the drum.	10M	CO3	BL3
	3			
8	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 600 mm apart and the masses of B ,C and D are 10 kg, 5 kg and 4 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.	10M	CO4	BL3
	OR			
9	Derive the expressions of (i) Tractive effort and (ii) Swaying Couple	10M	CO4	BL6
10	A shaft of 10 cm diameter and 100 cm long is fixed at one end and other end carries a flywheel of mass 80 kg. Taking young's modulus for the shaft material as 2×10^6 kg/cm^2 , find the natural frequency of longitudinal and transverse vibrations.	10M	CO5	BL3
	OR			
11	Derive Dunkerly's equation for the transverse vibrations of a shaft carrying several loads	10M	CO5	BL6

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