Course Code: 1950319 Roll No: **MLRS- R19**

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 Supply End Examination, July 2022

Dynamics of Machinery

(MECH)

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)

a. What is the principle of a gyroscope?
b. Define the superposition theorem as applicable to a system of forces acting on a mechanism.
c. Define flywheel?
d. Draw the tuning moment diagrams for Single cylinder double acting steam engine neglecting the effect of inertia of the connecting rod.
e. Distinguish between boundary friction and film friction. What is film lubrication and where it is applied.
f. How do the internal expanding shoe brakes become self locking?
g. What are the limitations of a simple Watt governor? Why has this type of governor become obsolete?
h. Why only a part of the unbalanced force due to reciprocating masses is balanced by revolving mass.
i. Define the terms vibration isolation and transmissibility.
j. What do you mean by period of vibration, cycle, frequency, and resonance as applied to vibratory motions?

PART- B

(10*5 Marks = 50 Marks)

2. How do the effects of gyroscopic couple and of centrifugal force make the rider of a two wheeler tilt on one side? Derive a relation for the limiting speed of the vehicle.

OR

3. A co-planar mechanism constituted of turning pairs is given. Explain, step by step, the manner of finding the inertia torque for the mechanism.

4. The turning moment diagram for any crank angle θ is given by the expression: $T = 750 + 1000 \sin 2\theta - 600 \cos 2\theta$ kgf-m. If the resisting torque is uniform, and the mean speed is 150 rpm, find: a) The H.P. of the engine b) The % fluctuation of speed, if the weight of the flywheel 200 kgf at 1 m radius.

OR

5. Derive the expressions for the angular velocity ω_c and angular acceleration α of the connecting rod of a reciprocating engine.

6. A single plate clutch having both sides effective is required to transmit 30 kW at 1500 rpm. The outer diameter of the plate is limited to 300 mm, and the intensity of pressure between the plates is not to exceed 0.07 MPa. Assuming uniform wear and a coefficient of friction 0.35, determine the inside diameter of the plate.

OR

7. a. What is the difference between absorption and transmission dynamometers? What are torsion dynamometers?

b. A bicycle and rider of mass 100kg are travelling at the rate of 16km/hour on a level road. A brake is applied to the rear wheel which is 0.9m in diameter and this is the only resistance acting. How far will the bicycle travel and how many turns will it make before it comes to rest? The pressure applied on the brake is 100N and coefficient of friction is 0.05.

8. The arms of a Hartnell governor are of equal length. When the sleeve is in the mid position, the masses rotate in a circle of diameter 200mm (the arms are vertical in the mid-position). Neglecting friction, the equilibrium speed for this position is 300rpm. Maximum variation of speed, taking friction into account, is to be ±5% of the mid position speed for a maximum sleeve movement of 25mm. The sleeve mass is 5kg and the friction at the sleeve is 30N.

OR

9. a. Explain why only a part of the unbalanced force due to reciprocating masses is balanced by revolving mass.

b. A shaft of span 3 m between two bearings carries two masses of 15 kg and 30 kg acting at the extremities of the arms 0.5 m and 0.6 m respectively. The planes in which these masses rotate are 1 m and 2 m respectively from the left end bearing.

10. a. Derive an expression for the damping coefficient in terms of the circular frequency, mass of the vibrating body, and damping factor.

b. In a spring -mass vibrating system, the natural frequency of vibration is reduced to half the value when a second spring is added to the first spring in series. Determine the stiffness of the second spring in terms of that of the first spring.

OR

11. In a single - degree damped vibrating system, the suspended mass of 4 kg makes 24 oscillations in 20 seconds. The amplitude decreases to 0.3 of the initial value after 4 oscillations. Find the stiffness of the spring, the logarithmic decrement, the damping factor, and the damping coefficient.