PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech. Summer 2018-19 Examination

Semester: 5   Date: 18/05/2019
Subject Code: 03109301   Time: 10:30 am To 1:00 pm
Subject Name: Theory of Machines   Total Marks: 60

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - (All are compulsory) (Each of one mark)   **(15)**

1. A governor is said to be hunting, if the speed of the engine
   (a) remains constant at the mean speed   (b) is above the mean speed
   (c) is below the mean speed   (d) Fluctuates continuously above and below
                                            the mean speed.

2. The engine of an aeroplane rotates in clockwise direction when seen from the tail end and the aeroplane takes a turn to the left. The effect of the gyroscopic couple on the aeroplane will be
 (a) to raise the nose and dip the tail   (b) to dip the nose and raise the tail
 (c) to raise the nose and tail   (d) to dip the nose and tail

3. The amount of energy absorbed by a flywheel is found from
(a) Speed-energy Diagram   (b) Velocity-crank angle diagram
(c) Acceleration crank angle diagram   (d) torque-crank angle diagram

4. For a safe Design, a friction clutch is designed assuming
(a) uniform pressure theory   (b) uniform wear theory   (c) any of the two

5. When frictional force helps the applied force in applying the brake, the brake is
(a) self-locking   (b) automatic   (c) self-energising

6. The vertical distance from the centre of the ball to a point where the axes of the arms (or arms produced) intersect on the spindle axis is known as _____.

7. The left hand and right hand sides of the ship, when viewed from the stern are called _____ and _____ respectively.

8. What is the condition of self-locking brake?

9. What is Turning moment Diagram?

10. Pitching is the movement of a complete ship _____ and _____ in a vertical plane about transverse Axis.

11. Define: Sensitiveness of Governor

12. What is the limitation of watt governor?

13. State the D'Alembert's Principle.

14. In case of a multiple disc clutch, if n1 is the number of discs on the driving shaft and n2 is the number of discs on the driven shaft, then what is the number of pairs of contact surfaces?

15. Moment of inertia of any section about an axis passing through its C.G is_____
(Maximum or Minimum).

Q.2 Answer the following questions. (Attempt any three)   **(15)**
   A) Explain: Isochronism & Hunting
   B) Explain gyroscopic effect on pitching in terms of ship.
   C) Derive the equation of natural frequency of compound pendulum.
   D) Explain Coefficient of fluctuation of energy.

Q.3 A) A Porter governor has equal arms each 250 mm long and pivoted on the axis of rotation. Each   **(07)**
ball has a mass of 5 kg and the mass of the central load on the sleeve is 25 kg. The radius of rotation of the ball is 150 mm when the governor begins to lift and 200 mm when the governor is at maximum speed. Find the range of speed, sleeve lift, governor effort and power of the governor in the following case: **(i)** When the friction at the sleeve is neglected, and
Find the range of speed in following case: **(ii)** When the friction at the sleeve is equivalent to 10 N.

B) The mass of turbine rotor of a ship is 800kg and has a radius of gyration of 0.75 m. It rotates   **(08)**
at 1800 rpm clockwise when viewed from the stern. Determine the gyroscopic effects in following case. (i) If the ship travelling at 100km/hr steers to the left along the curve of 80m radius.
(ii) If ship is pitching and the bow is descending with maximum velocity. The pitching is with

simple harmonic motion with periodic time of 20s and the total angular movement between extreme positions is 10°.

(iii) If the ship is rolling with velocity 0.03 rad/sec clockwise when viewed from stern.

In each case determine the direction in which the ship tends to move.

<div align="center">OR</div>

B) Establish a formula for the maximum torque transmitted by a single plate clutch of external and internal radii r1 and r2, if the limiting coefficient of friction is μ and the axial spring load is W. Assume that the pressure intensity on the contact faces is uniform. **(08)**

Q.4 A) Classify Dynamometer. Explain anyone in detail. **(07)**

<div align="center">OR</div>

A) Explain Turning Moment Diagram for a Four Stroke Cycle Internal Combustion Engine. **(07)**

B) Explain Equivalent Dynamical System. **(08)**