Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC SEMESTER V– EXAMINATION – SUMMER 2017

Subject Code:X51901 **Date: 29/04/2017**

Subject Name: THEORY OF MACHINES

Time: 02.30PM to 05.00PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	What is the function of a dynamometer? Classify dynamometers. Describe working of any one dynamometer with neat sketch.	**07**
	(b)	What is the function of a governor? Differentiate governor and flywheel. Explain sensitivity, hunting and stability for governor.	**07**
Q.2	**(a)**	(1) State and explain DÁlembert's Principle. (2) Explain dynamically equivalent system using suitable example.	**07**
	(b)	Give two differences and one similarity between brake and dynamometer. Also explain requirements of braking system.	**07**
		OR	
	(b)	Explain construction and working of double shoe brake with neat sketch. Derive the equation for its braking torque. List its advantages.	**07**
Q.3	**(a)**	A porter governor has all four arms 300 mm long. The upper arms are pivoted on the axis of rotation. Each ball has a mass of 4 kg and the mass of central load on sleeve is 50 kg. The radius of rotation of the ball is 200 mm if the lower arms are attached to the sleeve at a distance of 35 mm from the axis, determine the equilibrium speed of the governor.	**07**
	(b)	Explain the gyroscopic effect on ship during steering, pitching and rolling using regular terms and neat sketch.	**07**
		OR	
Q.3	**(a)**	For a watt governor the length of upper arm is 400 mm. the upper arms are inclined at 30^0 to vertical. Find the percentage increase in speed if the balls rises by 20 mm.	**07**
	(b)	Write a short note on turning moment diagram. Give suitable examples for different T-θ diagram.	**07**
Q.4	**(a)**	Explain stability of 2 wheeled vehicle.	**07**
	(b)	The T-θ diagram of an engine consists of intercepted areas which are +60, -95, +89, -62, +96 and -62 mm^2 in one cycle taken in the given order. The torque axis scale is 1 mm = 75 N-m and crank angle scale is 1 mm = 5^0. Mean speed of the engine is 450 rpm. Design the rim of the flywheel for the following data: (a) Limiting rim speed at mean radius = 30 m/s. (b) The fluctuation of speed = 2 % around mean speed. (c) Width to thickness ratio for rectangular rim section is 1.5 which contributes 100% of MI of flywheel. (d) Material density is 7400 kg/m^3. Neglect the flywheel effect of hub and arms.	**07**
		OR	

Q.4	**(a)**	A car is of total mass 1400 kg has the track width 150 cm. Each wheel having an effective diameter 60 cm and the mass moment of inertia 2.5 kg m^2. The mass moment of inertia of rotating parts of the engine is 1.4 kg m^2. The engine axis is parallel to the rear axle and the crankshaft rotates in the same sense as the road wheels. The gear ratio of the engine to the rear wheel is 3. The centre of mass of the car is 50 cm above the road level. If the car is rounding a curve of 60 m radius at a speed of 100 km/h, determine the load distribution on the inner and outer wheels.	**07**
	(b)	Explain the need of Flywheel. Derive the equation for coefficient of fluctuation of speed and energy.	**07**
Q.5	**(a)**	Explain Klien's construction method for analysis of inertia forces of a recriprocating engine.	**07**
	(b)	Explain synthesis of function generator.	**07**
		OR	
Q.5	**(a)**	Explain the following terms (1) Function generation (2) Path generation (3) Body guidance	**07**
	(b)	Explain compound pendulum method to determine mass moment of inertia of connecting rod.	**07**

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