Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–V (NEW) EXAMINATION – WINTER 2020

Subject Code:2151902 Date:05/02/2021

Subject Name:Theory of Machines

Time:10:30 AM TO 12:30 PM Total Marks: 56

Instructions:

1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Define: Dynamometer .List types of dynamometer.	**03**
	(b)	Distinguish Clutch and brake.	**04**
	(c)	A connecting rod is suspended from a point 25 mm above the centre of small end, and 650 mm above its centre of gravity, its mass being 37.5 kg. When permitted to oscillate, the time period is found to be 1.87 seconds. Calculate the dynamical equivalent system constituted of two masses, one of which is located at the small end centre.	**07**
Q.2	**(a)**	Write the gyroscopic effect on ships during steering.	**03**
	(b)	Conclude the concept of gyroscopic couple.	**04**
	(c)	The turbine rotor of a ship has a mass of 3500 kg. It has a radius of gyration of 0.45 m and a speed of 3000 r.p.m. clockwise when looking from stern. Determine the gyroscopic couple and its effect upon the ship: 1. When the ship is steering to the left on a curve of 100 m radius at a speed of 36 km/h. 2. When the ship is pitching in a simple harmonic motion, the bow falling with its maximum velocity. The period of pitching is 40 seconds and the total angular displacement between the two extreme positions of pitching is 12 degrees.	**07**
Q.3	**(a)**	Define:(1) fluctuation of energy (2)Maximum fluctuation of speed (3) Co-efficient of fluctuation of speed	**03**
	(b)	Explain centrifugal governor with the help of neat sketch.	**04**
	(c)	The turning moment diagram for a petrol engine is drawn to the following scales: Turning moment, 1 mm = 5 N-m; crank angle, 1 mm = 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line taken in order are 295, 685, 40, 340, 960, 270 mm^2. The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the coefficient of fluctuation of speed when the engine runs at 1800 r.p.m.	**07**
Q.4	**(a)**	Define: (1) flywheel (2) Maximum fluctuation of energy (3) co efficient of fluctuation of energy	**03**
	(b)	Explain briefly Hartnell governor.	**04**
	(c)	Design of flywheel for punching press with help of neat sketch.	**07**
Q.5	**(a)**	Classify clutch.	**03**
	(b)	Explain Rope brake dynamometer.	**04**

	(c)	A multiple disc clutch has five plates having four pairs of active friction surfaces. If the intensity of pressure is not to exceed 0.127 N/mm^2, Measure the power transmitted for multiple disc clutch at 500 r.p.m. The outer and inner radii of friction surfaces are 125 mm and 75 mm respectively. Assume uniform wear and take coefficient of friction = 0.3	**07**
Q.6	**(a)**	Classify brake.	**03**
	(b)	Explain torsion dynamometer.	**04**
	(c)	Evaluate the ratio of tension in the tight side to tension in the slack side for Band and block brake.	**07**
Q.7	**(a)**	Describe free body diagram.	**03**
	(b)	Explain D Alembert's Principle.	**04**
	(c)	Explain the static force analysis of mechanism with friction.	**07**
Q.8	**(a)**	Describe Newton's law of motion.	**03**
	(b)	Compare Centroid and Center of mass.	**04**
	(c)	Explain the dynamics force analysis of slider crank mechanism.	**07**

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