Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V- EXAMINATION – SUMMER 2016

Subject Code: 151902 **Date: 19/05/2016**

Subject Name: Theory of Machines

Time: 02:30 PM to 05:00 PM **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 Brake? What is meant by a self locking and a self energized brake?	**07**
	(b)	A simple band brake is operated by a lever of length 550 mm. The brake drum has a diameter of 550 mm and the brake band embraced 5/8 of the circumference. One end of a band is attached to the fulcrum of the lever while the other end is attached to a pin on the lever 100 mm from the fulcrum. If the effort applied to the end of the lever is 2.5 KN and the co-efficient of friction is 0.25. Find the maximum braking torque on the drum. Show the diagram of brake.	**07**
Q.2	**(a)**	Explain Frudennstein's method of three point synthesis of mechanism.	**07**
	(b)	Define Synthesis. Explain in brief the classification of synthesis.	**07**
		OR	
	(b)	Explain Bloch's Synthesis Method for synthesizing a 4 bar mechanism	**07**
Q.3	**(a)**	Explain the term height of governor. Derive an expression for height in case of Watt governor. What are the limitations of Watt governor?	**07**
	(b)	A Porter governor of an engine has a central mass of 18 kg. The lower and upper arms are pivoted on the axis of rotation and of 300 mm and 250 mm long respectively. The frictional force acting between spindle and sleeve is 25 N. if the limiting inclinations of the upper arms to the vertical are 30° and 40° for the minimum and maximum radius of rotation of the ball respectively. Determine the range of speed of the Porter governor with considering friction, if the mass of each ball is 2.5 kg.	**07**
		OR	
Q.3	**(a)**	What is the main function of a governor? How does it differ from flywheel? Differentiate between inertia and centrifugal governor.	**07**
	(b)	In a Wislon-Hartnell governor, each radial spring has a stiffness of 0.8 N/mm and their free length is 130 mm. The mass of each ball is 5 kg. The length of the ball arm of each bell crank lever is 90 mm and that of the sleeve arm is 80 mm. The auxiliary spring lever is pivoted at its mid point. When the radius of rotation of the ball is 110 mm, the equilibrium speed is 320 rpm. When the speed of sleeve increases by 5% then the sleeve is lift by 10 mm. find the required stiffness of auxiliary spring.	**07**
Q.4	**(a)**	Derive an equation for gyro-couple with usual notations.	**07**
	(b)	What is meant by dynamically equivalent system? State and prove conditions for it.	**07**
		OR	
Q.4	**(a)**	Discuss the effect of the gyroscopic couple on a disc fixed at a certain angle to a rotating shaft.	**07**
	(b)	Draw and explain Klein's construction for determining the velocity and acceleration of the piston of a reciprocating I.C.Engine.	**07**
Q.5	**(a)**	Derive an expression of turning moment on crankshaft of a horizontal	**07**

reciprocating engine neglecting the effect of the mass of the connecting rod.

(b) A flywheel fitted to a punching press runs at 250 rpm and has radius of gyration is 1m. The press punches 700 holes per hour. The energy required for each punching operation is 20KN.m and 2 second for each operation, determine the power of the motor and mass of the flywheel if speed of the flywheel is not fall below 220 rpm. **07**

OR

Q.5 **(a)** Explain the turning moment diagram for 4 cylinder four stroke cycle internal combustion engine. **07**

(b) What is the function of dynamometer? Classify the dynamometers. Explain with neat sketch any one dynamometer. **07**

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