

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2017

Subject Code: 2151902

Date: 28/11/2017

Subject Name: Theory of Machines

Time: 10:30 AM TO 01:00 PM

Total Marks: 70

Instructions:

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

		MARKS
Q.1	(a) What is Gyroscopic couple ?	03
	(b) Explain the gyroscopic effect on steering of ship	04
	(c) Establish formula for the fractional torque transmitted by single disc clutch.	07
Q.2	(a) What are characteristics of friction lining material used for clutch ?	03
	(b) Explain the working of cone clutch with neat sketch.	04
	(c) A multiple disc clutch, steel on bronze is to transmit 4.5kW at 750 rpm. the inner radius of the contact is 40mm and outer radius of the contact is 70mm. The clutch operates in oil with an expected coefficient of 0.1. The average allowable pressure is 0.35N/mm ² . Find : 1. the total number of steel and bronze discs 2. the actual axial force required 3. the actual average pressure and 4. the actual maximum pressure.	07
	OR	
	(c) A centrifugal clutch is to be design to transmit 15kW at 900 rpm. The shoes are four in number. The speed at which the engagement begins is 3/4 th of the running speed. The inside radius of the pulley rim is 150mm. the shoes are lined with the material of coefficient of friction of 0.25. Determine 1. Mass of the shoes 2. Size of the shoes.	07
Q.3	(a) Explain working of epicyclic train dynamometer.	03
	(b) Describe with the help of a neat sketch the principles of operation of an internal expanding shoe brake.	04
	(c) A simple band brake is applied on a drum of 560mm diameter which is rotating at 240rpm. The band having an angle of contact on the drum of 270°. One end of the band is fitted to a fixed pin while the other end is fitted to the lever 140mm from the fixed pin. The lever is 800mm long and is perpendicular to the diameter that bisects the angle of contact. If the coefficient of friction is 0.3, what will be the necessary pull at the end of the lever to stop the drum when the power absorbed is 40 kW. Also calculate the width of the band if its thickness is 3mm and maximum tensile stress is limited to 40N/mm ² .	07
	OR	
Q.3	(a) What are the turning moment diagrams? Why are they drawn?	03
	(b) Explain following 1. Sensitiveness of Governors 2. Hunting and stability of governors.	04

- (c) Turning moment area for the revolution of a multicylinder engine with reference to the mean turning moment in sq. cm are : **07**
- 0.32, 4.08, - 2.67, 3.33, - 3.1, 2.26, - 3.74, 2.74, - 2.58
The scale for the ordinate and abscissa are 1cm=14⁰, 1cm= 6000 N-m
The mean speed is 200 rpm with 1.5% fluctuation. if hoop stress in the rim material is not to exceed 56bar, calculate the diameter and X-section of rim of the flywheel. Neglect the effect of bars and arms. Density of material = 0.0672 kg/cm³
- Q.4** (a) What is the advantage of a transmission type dynamometer over an absorption type dynamometer? **03**
(b) Describe with the help of a neat sketch the principles of operation of an internal expanding shoe brake. **04**
(c) List experimental methods used for finding out the radius of gyration of components having complicated geometry? Explain any one method in detail, with neat sketch. **07**
- OR**
- Q.4** (a) Explain D’alembert’s Principle **03**
(b) What is meant by a self locking and a self energized brake ? **04**
(c) An automobile car of weight of 20kN is taking right turn along a curved path of 25m mean radius at 30km/h. the width of track of vehicle is 1.3m and the wheel base is 2m. the effective wheel radius is 0.3m. the moment of inertia of the rotating parts is 10kgm² and moment of inertia of each wheel is 10kg.m². The C.G. of the car is 0.75m above the road level. The engine flywheel rotates at 3000 rpm clockwise when viewed from front. find out the reactions between the wheels and the ground. **07**
- Q.5** (a) Describe construction and operation of Prony brake absorption dynamometer. **03**
(b) Explain impulse and momentum **04**
(c) In I.C. Engine, the crank radius is 300mm and length of connecting rod is 750mm. The mass of the piston is 1.25kg and diameter of the piston is 100mm. The speed is 900 rpm and net gas pressure is 750kN/ m². Find: 1. Piston Effort, 2. Thrust in connecting rod, 3. Piston side thrust, 4. crank pin effort, 5. Torque acting on crankshaft and 6. Radial force or load on main bearings when crank has made 45⁰ from TDC. **07**
- OR**
- Q.5** (a) What is isochronism in governors? **03**
(b) Discuss the effect of inertia force on connecting rod. **04**
(c) Derive the expression for total torque on crank shaft of IC engine by considering dynamic force. **07**
