Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC - SEMESTER – V • EXAMINATION – WINTER 2012

Subject code: X 51901   **Date: 11/01/2013**
Subject Name: Theory of machine
Time: 02.30 pm - 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)** Derive the equation of braking torque for band and block brake with usual   **07**
notations.
    (b) A bicycle and rider of mass 150 kg are traveling at a speed of 10 km/h on a   **07**
level road. The rider applies a brake to the rear wheel which is 1.0 m in
diameter. How far the bicycle will travel before it comes to rest. The force
applied to the brake is 100 N. Take µ=0.05. Assume that no other
resistance is acting on bicycle. Also find the number of revolution made by
the cycle before it comes to rest.

Q.2 **(a)** Explain the function of governer. Also give its classification.   **07**
    (b) Explain: Watt governer and derive the equation for height of governer.   **07**
OR
    (b) In a porter governer, upper links are 250 mm long hinged at 25 mm from   **07**
the governer shaft axis and lower links are 350 mm long hinged to the
sleeve at 30 mm from the shaft axis. Sleeve mass is 50 kg and rotating
masses are 5 kg each. The rotating masses rotating at a radii of 210 mm. If
the speed suddenly changes by 6%. Find out governer effort and power.

Q.3 **(a)** Explain: Gyroscopic effect on ship during steering and pitching.   **07**
    (b) An aero plane makes a half circle of 100 m radii towards left when flying   **07**
at 400 km/hr. The engine and propeller of plane weights 500 kg and has a
radii of gyration 30 cm. The engine rotates at 3000 rpm anticlockwise
when viewed from front . Find the gyroscopic couple and its effect.
OR
Q.3 **(a)** Derive the equation for gyroscopic couple: $c = I\omega\omega_p$.   **07**
    (b) What is flywheel? Derive the equation for coefficient for fluctuation of   **07**
speed & energy.

Q.4 **(a)** The torque exerted on the crankshaft of two stroke engine is given by   **07**
$T = 7000 + 1000 \sin 2\theta - 2000 \cos 2\theta$. where T is in N-m and θ is the crank
displacement from I.D.C. Assuming the resisting torque to be constant, the
mass of the flywheel is 500 kg and radii of gyration is 750 mm. find the
power developed & total fluctuation in speed when the engine speed is 300
rpm.
    (b) Explain: The flywheel in punching press.   **07**
OR
Q.4 **(a)** Explain: D'alembert's principle.   **07**
    (b) In IC engine mechanism, the crank radii is 400 mm and connecting rod is   **07**
950 mm long. The diameter of piston is 100 mm. The net gas pressure
acting on the piston is 15 MPa. Find:

      I. Thrust in connecting rod.
     II. Piston side thrust & Torque acting on crankshaft when crank has
        turned 45^0 from IDC.

Q.5 **(a)** Explain: Biffiliar suspension. **07**
    (b) Explain: Function and path generation. **07**
OR
Q.5 **(a)** Explain: Dynamically equivalent system. **07**
    (b) Determine the chebyshev spacing for function $y=x^{1.5}$ for the range $0 \leq x \leq 3$ **07**
        where three precision points are required.

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