

GUJARAT TECHNOLOGICAL UNIVERSITY**PDDC-Semester –V (May-2012) Examination****Subject code: X51901****Subject Name: Theory of Machines****Date: 14/05/2012****Time: 10.30 am – 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.

- Q.1** (a) Classify centrifugal governors. What is the difference between centrifugal and inertia type governors? **07**
- (b) Explain the effect of gyroscopic couple on aeroplane. **07**
- Q.2** (a) Explain with neat sketch internal expanding brake and its torque transmitting capacity. **07**
- (b) An open belt drive connects two pulleys 120 cm and 50 cm diameter, on parallel shafts 4 meters apart. The mass of the belt is 0.9 Kg per meter length and the maximum tension is not to exceed 2000 N. The coefficient of friction is 0.3. The 120 cm diameter pulley, which is driver, runs at 200 rpm. Due to belt slip on one of the pulleys, the velocity of the driven shaft is only 450 rpm. Calculate the torque on each of the shafts, the power transmitted and power lost in friction. What is the efficiency of the drive? **07**
- OR**
- (b) Explain stability of a two-wheeled vehicle. **07**
- Q.3** (a) Explain inertia force analysis of a reciprocating engine using Klen's construction. **07**
- (b) What is the difference between piston effort, crank effort and crank-pin effort? **07**
- OR**
- Q.3** (a) Explain dynamic equivalent system. **07**
- (b) The turning moment diagram for a petrol engine is drawn to the following scales : **07**
 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 mm². 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 rpm.
- Q.4** (a) Synthesis a 4-bar mechanism to generate a function $y = \log_{10} x$ in the interval of $1 \leq x \leq 10$. The input crank length is to be 50 mm. The input crank is to be rotate from 45° to 105° while output crank moves from 135° to 225° . Use 3 precession points with Chebyshev spacing's. **07**
- (b) Differentiate between path generation and function generation. **07**

OR

- Q.4 (a)** Explain the terms Sensitiveness & Hunting in case of centrifugal governor. What is isochronous governor? **07**
- (b)** The mass of the turbine rotor of a ship is 20 tones and has a radius of gyration of 600 mm. Its speed is 2000 rpm. The ship pitches 6° above and 6° below the horizontal position. A complete oscillation takes 30 seconds and the motion is simple harmonic. Determine the
1. Maximum gyroscopic couple, 2. Maximum angular acceleration of the ship during pitching, and 3. The direction in which the bow will tend to turn when rising, if the rotation of the rotor is clockwise when looking from the left. **07**
- Q.5 (a)** Prove that the ratio of the driving tensions on the two sides of a pulley is $T_1/T_2 = e^{\mu\theta}$ **07**
Where, T_1 = Tension in the tight side of the belt,
 T_2 = Tension in the slack side of the belt
 θ = Angle of contact in radians
 μ = coefficient of friction between the belt and pulley.
- (b)** Write a short note on 'Prony Brake Dynamometer'. **07**
- OR**
- Q.5 (a)** Differentiate between Flywheel and governor. **07**
- (b)** Explain Bloch's Synthesis Method for synthesizing a 4 bar mechanism **07**
