

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC - SEMESTER-V • EXAMINATION – SUMMER 2013

Subject Code: X 51901

Date: 10-05-2013

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)** The arms of a Porter governor are each 250 mm long and pivoted on the governor axis. The mass of each ball is 5 kg and the mass of the central sleeve is 30 kg. The radius of rotation of the balls is 150 mm when the sleeve begins to rise and reaches a value of 200 mm for maximum speed. Determine the speed range of the governor. If the friction at the sleeve is equivalent of 20 N of load at the sleeve, determine how the speed range is modified. **07**
- (b)** Explain effort and power of Governor. **07**
- Q 2 (a)** What is meant by terms sensitiveness, stability and hunting in governing mechanism? **07**
- (b)** Explain precisely the use of turning moment diagram of reciprocating engine. **07**
- OR**
- (b)** Explain Function generation and Path generation. **07**
- Q 3 (a)** Explain 1. Piston effort 2. Crank effort 3. Crank pin effort **06**
- (b)** The crank pin circle radius of horizontal engine is 300 mm. The mass of reciprocating parts is 250 kg. When the crank has traveled 60° from I.D.C., the difference between the driving and the back pressure is 0.35 N/mm^2 . The connecting rod length between centers is 1.2 m and the cylinder bore is 0.5 m. If the engine runs at 250 r.p.m. and if the effect of piston rod diameter is neglected. Calculate **08**
1. Pressure on slide bars 3. Tangential force on crank-pin
2. Thrust on connecting rod 4. Turning moment on crank shaft
- OR**
- Q 3 (a)** With neat sketch explain the effect of gyroscopic couple on naval ship. **07**
- (b)** An aeroplane makes a complete half circle of 50 m radius, towards left, when flying at 200 km per hour. The rotary engine and the propeller of the plane have a mass of 400 kg. with the radius of gyration of 300 mm. The engine runs at 2400 r.p.m. clockwise, when viewed from the rear. Find the gyroscopic couple on the aircraft and state its effect on it. What will be the effect, if the aeroplane turns to its right instead of to the left? **07**
- Q 4 (a)** Explain Rope brake dynamometer. **07**

- (b) A band brake acts on the 3/4th of circumference of a drum of 450 mm diameter which is keyed to the shaft. The band brake provides a braking torque of 225 N-m. One end of the band is attached to a fulcrum pin of the lever and the other end to a pin 100 mm from the fulcrum. If the operating force is applied at 500 mm from the fulcrum and the coefficient of friction is 0.25, find the operating force when the drum rotates (a) anticlockwise (b) clockwise 07

OR

- Q 4 (a) State and Explain D'Alembert's principle. 04
(b) Classify "Brakes" 04
(c) Explain operation of flywheel in punching machine. 06
- Q 5 (a) Write a short note on "Dynamically Equivalent System" 07
(b) Define the terms related to gyroscopic 07
1. Spin axis 2. Precession axis

OR

- Q 5 (a) A four bar mechanism is to be designed, by using three precision points, to generate the function $y = x^{1.5}$, for the range $1 \leq x \leq 4$. Assuming 30° starting position and 120° finishing position for the input link and 90° starting position and 180° finishing position for the output link, find the values of x , y , θ and ϕ corresponding to the three precision points 07
(b) Derive Freudenstein's Equation for Four bar mechanism 07
