

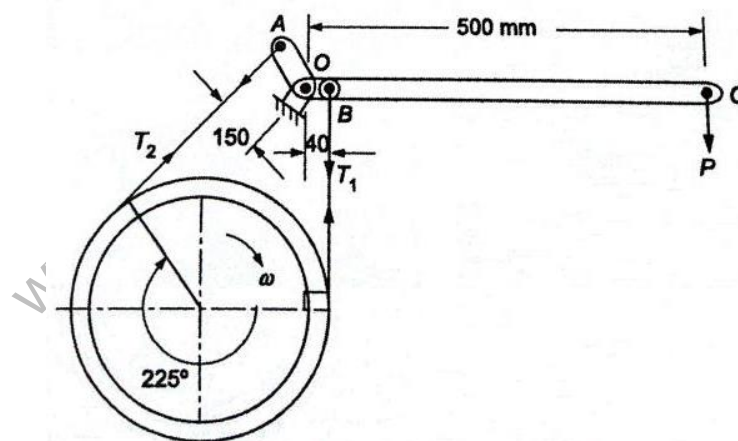
GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (Old) EXAMINATION – WINTER 2019****Subject Code: 151902****Date: 29/11/2019****Subject Name: Theory Of Machines****Time: 10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

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

- Q.1** (a) Define (i) Hunting (ii) Sensitiveness (iii) Sleeve lift and (iv) Isochronisms for governor. **07**
- (b) What is the function of dynamometer? Classify the dynamometers. Explain with neat sketch any one dynamometer. **07**
- Q.2** (a) What is meant by a self locking and a self energized brake? **07**
- (b) The arms of a porter governor are each 25 cm long and pivoted on the governor axis. Mass of each ball is 5 kg and mass of the central sleeve is 30 kg. The radius of rotation of the balls is 15 cm when the sleeve begins to rise and reaches a value of 20 cm for maximum speed. Determine the range of the governor. **07**

OR

- (b) Give classification of governors. Prove that, for Watt governor, height of the governor $h = 895 / N^2$. Where N is speed of rotation of sleeve. **07**
- Q.3** (a) Describe the construction and operation of a rope brake dynamometer. **07**
- (b) A differential band brake shown in Figure, has an angle of contact of 225° . The band has a lining whose coefficient of friction is 0.3 and the drum diameter is 400mm. The brake is to sustain a torque of 375 Nm. Find (i) the necessary force for the clockwise and counter-clockwise rotation of the drum and (ii) the value of OA for the brake to be self-locking, when the drum rotates clockwise. **07**

**OR**

- Q.3** (a) List various terms used for Ship. Explain the gyroscopic effect of rotor of ship in case of rolling, pitching and steering. **07**
- (b) The moment of inertia of an aero plane propeller is 20 kg.m^2 and the speed of rotation is 1250 rpm clockwise when viewed from the front. The speed of the flight is 200 km/hr. Calculate the gyroscopic reaction of the propeller on the aero plane when it makes a left hand turn on a path of 150 m radius. **07**
- Q.4** (a) Explain the turning moment diagram for 4 cylinder four stroke cycle internal combustion engine. **07**

- (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.4 (a)** What are the differences between governor and flywheel? Specify their use in particular application. **07**
- (b)** Explain the term (1) Turning moment diagram, (2) Coefficient of fluctuation of speed and (3) Coefficient of fluctuation of energy. **07**
- Q.5 (a)** Draw and explain Klein's construction for determining the velocity and acceleration of the piston in slider crank mechanism. **07**
- (b)** A vertical IC engine has a cylinder bore of 150 mm and stroke of 200 mm. The connecting rod is 350 mm long. The mass of the reciprocating parts is 1.6 kg. During the expansion stroke with crank angle 30° from top dead centre, the gas pressure is 750 kN/m^2 . Determine the piston effort when engine runs at 1800 rpm. **07**

OR

- Q.5 (a)** Describe the procedure to design a four-bar mechanism by relative pole method when three positions of the input link ($\theta_1, \theta_2, \theta_3$) and the output link (ϕ_1, ϕ_2, ϕ_3) are known. **07**
- (b)** Synthesise a 4-bar linkage using Freudenstein's equation to generate the function $y = x^{1.5}$ for the interval $1 \leq x \leq 4$. The input crank is to start from 30° and have a range of 90° . The output follower is to start from 0° and have range of 90° . Take three accuracy points. Assume length of the fixed link to be 50 mm. **07**

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