

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- VIth SEMESTER–EXAMINATION – MAY- 2012****Subject code: 161806****Date: 22/05/2012****Subject Name: Mechanics of Machines-I****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) Differentiate between Flywheel and governor. **07**
 (b) Derive the relation between the height of the porter governor and angular speed of the balls. **07**

- Q.2** (a) What is Cam? What is the function of Cam? Classify different types of cams. **07**
 (b) A cam drives a flat reciprocating follower: during first 120° rotations of the cam, follower moves outwards through a distance of 3 cm with uniform velocity. The follower dwells during next 100° cam rotation. During next 90° cam rotation, the follower moves outwards with SHM. Follower dwells for the remaining cam rotation. Draw cam profile. **07**

OR

- (b) The dimensions and configuration of the four bar mechanism, shown in 2.1, **07**
 The angle $AP_1P_2 = 60^\circ$. The crank P_1A has an angular velocity of 10 rad/s and an angular acceleration of 30 rad/s^2 , both clockwise. Determine the angular velocities and angular accelerations of P_2B , and AB and the velocity and acceleration of the joint B.

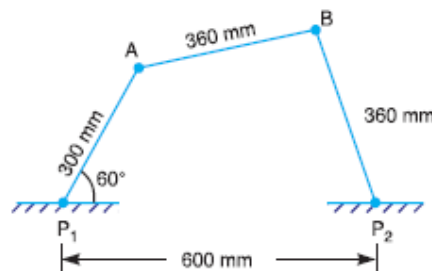


Figure 2.1

- Q.3** (a) Explain the terms: piston effort, crank effort and crank-pin effort. **07**
 (b) What is the function of dynamometer? Explain absorption type of dynamometer. **07**

OR

- Q.3** (a) What do you understand by the instantaneous centre of rotation (ICR) in kinematic of machines? Discuss the three types of instantaneous centers for a mechanism. **07**
 (b) Derive an expression for the length of cross belt drive. **07**
- Q.4** (a) Discuss the controlling force and stability of a governor and show that the stability of a governor depends on the slope of the curve connecting the controlling force (F_C) and radius of rotation (r) and the value (F_C / r). **07**

- (b) A cam has straight working faces which are tangential to a base circle of diameter 90 mm. The follower is a roller of diameter 40 mm and the centre of roller moves along a straight line passing through the centre line of the cam shaft. The angle between the tangential faces of the cam is 90° and the faces are joined by a nose circle of 10 mm radius. The speed of rotation of the cam is 120 revolutions per min. Find the acceleration of the roller centre 1. when during the lift, the roller is just about to leave the straight flank ; and 2. when the roller is at the outer end of its lift. 07

OR

- Q.4 (a) Derive the condition for transmitting the maximum power in a flat belt drive. 07
- (b) In a spring loaded governor of the Hartnell type, the mass of each ball is 1kg, length of vertical arm of the bell crank lever is 100 mm and that of the horizontal arm is 50 mm. The distance of fulcrum of each bell crank lever is 80 mm from the axis of rotation of the governor. The extreme radii of rotation of the balls are 75 mm and 115 mm. The maximum equilibrium speed is 5 per cent greater than the minimum equilibrium speed which is 360 rpm. Find, neglecting obliquity of arms, initial compression of the spring and equilibrium speed corresponding to the radius of rotation of 100 mm. 07

- Q.5 (a) A horizontal cross compound steam engine develops 300 kW at 90 rpm. The coefficient of fluctuation of energy as found from the turning moment diagram is to be 0.1 and the fluctuation of speed is to be kept within $\pm 0.5\%$ of the mean speed. Find the weight of the flywheel required, if the radius of gyration is 2 meters. 07
- (b) Derive an expression for the length of the arc of contact in a pair of meshed spur gears. 07

OR

- Q.5 (a) Explain briefly the differences between simple, compound, and epicyclic gear trains. What are the special advantages of epicyclic gear trains? 07
- (b) Explain the function of flywheel, coefficient of fluctuation of speed & derive an expression for energy stored in a flywheel. 07
