

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV • EXAMINATION – SUMMER • 2014****Subject Code: 142001****Date: 27-06-2014****Subject Name: Kinematics and Dynamics of Machines****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) List the straight line motion mechanism and describe any one with neat sketch. **07**
(b) Draw profile of a cam operating a roller reciprocating follower having a lift of 35 mm. The line of stroke of the follower passes through the axis of the cam shaft. The least radius of the cam is 40 mm. Roller radius is 10 mm. Cam rotates at 630 rpm counter-clockwise with following follower motion. **07**
Follower is raised with SHM for 90° of cam rotation.
Follower dwells for next 60° of cam rotation.
Follower lowers with uniform acceleration and deceleration for next 150° of cam rotation.
The follower dwells for rest of the cam rotation.
- Q.2** (a) List the quick return motion mechanism. Discuss their application. Also describe any one in detail. **07**
(b) Describe graphical method to determine velocity and acceleration of four bar mechanism. **07**
- OR**
- (b) In a simple steam engine, the length of the crank and connecting rod are 0.3 m and 0.4 m respectively. The center of mass is 0.22 m from the cross-head center. The engine speed is 30 rpm, determine velocity and acceleration of the center of mass of the connecting rod for the position when the crank has turned 45° from the inner-dead center. **07**
- Q.3** (a) Discuss briefly the effect of Gyroscopic Couple and Centrifugal Couple on stability of four wheeled vehicle negotiating a curve. **07**
(b) A Ship is propelled by the turbine rotor of a ship has a mass of 6 tones and rotates at 2400 rpm. The direction of rotation of the rotor is clockwise when viewed from the stern. The radius of gyration of rotor is 450 mm. Determine the gyroscopic couple and its effect when **07**
(1) The ship turns to left at a radius of 60 m with a speed of 18 knots.
(1 knots = 1860 m/h)
(2) Ship pitches 7.5 degree above and 7.5 degree below the normal position and bow is descending with its maximum velocity, the pitching motion is simple harmonic with a periodic time of 18 seconds.
- OR**
- Q.3** (a) Two 20° involute spur gears have a module of 10 mm. the addendum is one module. The no. of teeth of gear and pinion are 50 and 13 respectively. Does interference occur? If it occurs, to what value should the pressure angle be changed to eliminate interference? **07**
(b) Sketch two teeth of a gear and show the following: face, flank, top, land, bottom land, addendum, dedendum, tooth thickness, space width, face width, circular pitch. **07**

- Q.4 (a)** In an open-belt drive, the diameters of the larger and the smaller pulleys are 1200mm and 800mm respectively. The smaller pulley rotates at 320rpm. The centre distance between the shafts is 4 m. When stationary, the initial tension in the belt is 2.8 KN. The mass of the belt is 1.8kg/m and the coefficient of friction between the belt and pulley is 0.25. Determine the power transmitted. **07**
- (b)** Derive the condition for maximum power transmitted by a belt drive considering the effect of centrifugal tension. **07**
- OR**
- Q.4 (a)** A circular disc mounted on a shaft carries three attached masses of 6 kg, 4 kg and 3.5 kg at radial distances of 75 mm, 85 mm and 50 mm and the angular position of 35, 140, and 250 respectively. The angular position is measured in counter clockwise from the reference line along the x-axis. Determine the amount of the counter mass at a radial distance of 75 mm required for the static balance. **07**
- (b)** Explain the procedure for balancing of several masses in different planes. **07**
- Q.5 (a)** Explain longitudinal, transverse and torsional vibration with neat sketch. **07**
- (b)** In a spring mass vibrating system, the natural frequency of vibration is 3.56 Hz. When the amount of the suspended mass is increased by 5 kg, the natural frequency is lowered to 2.9 Hz. Determine the original unknown mass and the spring constant. **07**
- OR**
- Q.5 (a)** Discuss briefly the different types of gear train with neat sketch. **07**
- (b)** What do you mean by Pantograph? Where it used? Show that it is a straight line mechanism with usual notations. **07**
