

GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-IV Examination-Nov/Dec-2011****Subject code: 142001****Date: 05/12/2011****Subject Name: Kinematics & Dynamics Of Machines****Time: 02.30 pm -5.00 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) What are quick return mechanisms? Where are they used? Discuss the functioning of any one of them. **07**
- (b) Distinguish between **07**
- (i) Mechanism and machine
 - (ii) Kinematics and dynamics
 - (iii) Lower pair and higher pair

- Q.2** (a) In slider crank mechanism, the Crank is 480 mm long and rotates at 20 rad/sec in counter clockwise. The length of the connecting rod is 1600 mm. When the crank turns 60° from the inner dead centre, by graphical method determine the **07**
- (i) Velocity of the slider
 - (ii) Velocity of a point E located at a distance 450mm on the connecting rod extended.
 - (iii) Position and velocity of a point F on the connecting rod having the least absolute velocity.
 - (iv) Angular velocity of the connecting rod.
 - (v) Velocity of rubbing at the pins of the crankshaft, crank and the cross-head having diameter 80, 60 and 100 mm respectively.
- (b) ABCD is a four bar chain mechanism, the link dimensions are AB=50 mm, BC=66 mm, AD=100 mm, CD =56 mm. The crank AB rotates at constant angular velocity of 10.5 rad/sec in counter clockwise direction. Determine velocity and acceleration of mid point M of the link BC by graphical method. Angle DAB = 60° **07**

OR

- (b) What is the Coriolis acceleration? In which cases does it occur? Derive an expression for the magnitude and direction of coriolis component of acceleration. **07**
- Q.3** (a) Explain the effect of creep and initial tension in belt drive. **07**
- (b) An open flat belt drive connects two parallel shafts 1.2 meters apart. The driving and the driven shafts rotate at 350 r.p.m. and 140 r.p.m. respectively and the driven pulley is 400 mm in diameter. The belt is 5 mm thick and 80 mm wide. The coefficient of friction between the belt and pulley is 0.3 and the maximum permissible tension in the belting is 1.4 MN/m². Determine: **07**
1. diameter of the driving pulley,
 2. maximum power that may be transmitted by the belting, and
 3. Required initial belt tension.

OR

- Q.3** (a) Explain static and dynamic balancing. **07**

- (b) A, B, C and D are four masses carried by a rotating shaft at radii 100, 125, 200 and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B, C and D are 10 kg, 5 kg, and 4 kg respectively. Find the required mass A and the relative angular settings of the four masses so that the shaft shall be in complete balance. **07**

- Q.4** (a) Derive an expression for the minimum number of teeth required on the pinion in order to avoid interference in involute gear teeth when it meshes with wheel. **07**
- (b) Differentiate between Involute and Cycloidal gear tooth profile. Explain law of gearing. **07**

OR

- Q.4** (a) Explain the effect of the gyroscopic couple on a two wheeled vehicle when taking a turn. **07**
- (b) The mass of the turbine rotor of a ship is 20 tonnes and has a radius of gyration of 0.60 m. Its speed is 2000 r.p.m. 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 following: **07**
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.

- Q.5** (a) Explain vibration isolation. **07**
- (b) A cam is to give the following motion to a knife-edged follower : **07**
1. Outstroke during 60° of cam rotation,
 2. Dwell for the next 30° of cam rotation,
 3. Return stroke during next 60° of cam rotation, and
 4. Dwell for the remaining 210° of cam rotation.
- The stroke of the follower is 40 mm and the minimum radius of the cam is 50 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when the axis of the follower passes through the axis of the cam shaft.

OR

- Q.5** (a) Define and explain with neat sketch Base circle, Prime circle, Pressure angle, Pitch curve and Pitch point related to cam and follower. **07**
- (b) Design a cam for operating the exhaust valve of an oil engine. It is required to give equal uniform acceleration and retardation during opening and closing of the valve each of which corresponds to 60° of cam rotation. The valve must remain in the fully open position for 20° of cam rotation. The lift of the valve is 37.5 mm and the least radius of the cam is 40 mm. The follower is provided with a roller of radius 20 mm and its line of stroke passes through the axis of the cam. **07**
