

Seat No: _____

Enrollment No: _____

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. Sem-IV Examination June- 2010

Subject Code: 142001

Subject Name: Kinematics & Dynamics of Machines

Date: 22 /06 /2010

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)** The driving crank AB of the quick return mechanism shown in **Figure 1** revolves at a uniform speed of 200 rpm. Find the velocity of tool box R, when the crank makes an angle of 60 degree with the vertical line of centers PA. Also show the velocity of block B along the slotted lever PQ. Use graphical method. **07**
- (b)** For the Figure 1 find out the acceleration of the tool-box R. Use graphical method. **07**
- Q-2 (a)** Two gears in mesh have a module of 8 mm and a pressure angle of 20 degree. The larger has 57 while the pinion has 23 teeth. If the addenda on pinion and gear wheels is equal to one module, find **07**
- (i) the number of pairs of teeth in contact
- (ii) the angle of action of the pinion and the gear wheel
- (iii) the ratio of the sliding to rolling velocity at (a) the beginning of contact (b) the pitch point (c) the end of contact.
- (b)** Determine the maximum power that can be transmitted using a belt of 100 mm x 10 mm with an angle of lap of 160 degree. The density of belt is 0.001gm per cubic mm. The co-efficient of friction is 0.25. The tension in the belt should not exceed 1.5 N per square mm. **07**
- OR**
- (b)** The configuration diagram of a wrapping machine is given in **Figure 2**. Determine the velocity of the point P on the bell-crank lever DCP if crank OA rotates at 80 rad/s. Use instantaneous centre method. **07**
- Q-3 (a)** Depending upon the number of restraints imposed on relative motion of two links connected together, classify the kinematic pairs. **07**
- (b)** With the Kleins construction show the velocity and acceleration diagrams for a slider crank mechanism. **07**
- OR**
- Q-3 (a)** Show two inversions of slider crank mechanism and four bar mechanism each. **07**
- (b)** What is velocity of rubbing? Explain it for a four bar mechanism with neat sketches. **07**
- Q-4 (a)** An aircraft consists of a propeller. It also consists of engine and propeller of mass moment of inertia 150 kg. m². The engine rotates at 3600 rpm in a sense clockwise looking from rear. The aircraft completes half circle of radius 100m towards left when flying at 360 km per hr. Determine the gyroscopic couple on the air craft and state its effects. **07**

- (b) Differentiate between static and dynamic balancing and discuss the balancing of rotating masses in single plane. 07

OR

- Q-4 (a) Four masses 200 kg, 300 kg, 240 kg and 260 kg are attached to a shaft. These masses are revolving at radii 270 mm, 210 mm, 300 mm and 360 mm respectively in planes measured from A1 at 270 mm, 420 mm and 720 mm respectively. The angle measured anticlockwise are m_1 to m_2 45 degree, m_2 and m_3 75 degree, m_3 to m_4 135 degree and the distance between the planes L and M in which the balance masses are to be placed is 500mm. The distance between planes A1 and L is 120 mm and M and A4 is 100mm. If the balancing masses revolve at a radius of 72 mm, find their magnitude and angular positions. 07

- (b) Explain with neat sketches the gyroscopic effects in four wheeler for its stability. 07

- Q-5 (a) Define vibrations. What are the different types of vibrations? Explain them with neat sketches and applications. 07

- (b) Draw the profile of a cam operating a knife-edge follower when the axis of the follower passes through the axis of cam shaft from the following data. 07

(a) Follower to move outwards through 40 mm during 60 degree of cam rotation (b) follower to dwell for the next 45 degree. (c) follower to return to its original position during next 90 degree (d) Follower to dwell for the rest of cam rotation.

The displacement of the follower is to take place with simple harmonic motion during both the outward and return strokes. The least radius of cam is 50 mm.

OR

- Q-5 (a) Write a short note on the types of gear trains. 07
- (b) What is degree of freedom? For a planar mechanism derive the Grubler's equation. 07

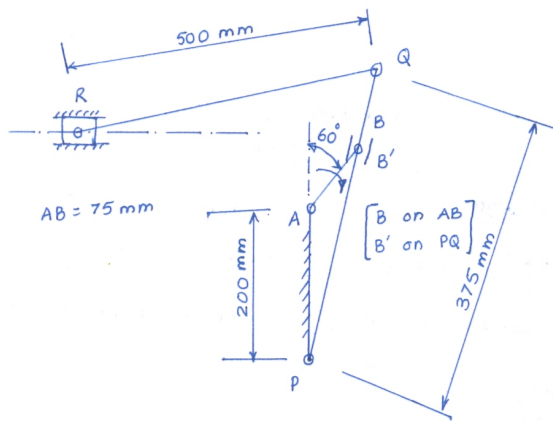


Fig. 1, Q. 1 (a), (b)

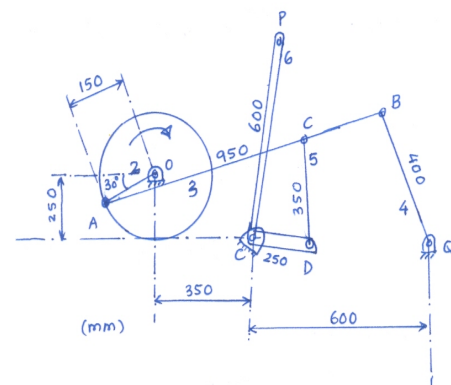


Fig. 2, Q. 2 (b) OR