

GUJARAT TECHNOLOGICAL UNIVERSITY**B. E. Sem-IV Examination June- 2011****Subject code: 142001****Subject Name: Kinematics & Dynamics of Machine****Date: 15/06/2011****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) What do you mean by inversion of mechanism? Explain with sketches all inversion of single slider crank mechanism. Where these inversions are used. **07**
- (b) A cam with a minimum radius of 25mm is to be designed for a knife edge follower with the following data: **07**
- To raise the follower through 35mm during 60° rotation of cam.
 - Dwell for next 40° of cam rotation.
 - Descending of the follower during the next 90° of cam rotation.
 - Dwell during rest of cam rotation.
- Draw the profile of cam if ascending and descending of cam is with simple harmonic motion and line of stroke of follower is offset 10 mm from the axis of cam shaft.
- What is the maximum velocity and acceleration of the follower during the ascent and the descent if cam rotates at 150 rpm.
- Q.2** (a) Derive the expression for limiting tension in case of flat belt drive. **07**
- (b) A belt drive is required to transmit 10 KW from a motor running at 600 rpm. The belt is 12 mm thick and mass density of 0.001 g/mm^3 . Safe stress in the belt is not to exceed 2.5 N/mm^2 . Diameter of the driving pulley is 250 mm, where as the speed of driven pulley is 220 rpm. The two shafts are 1.25m apart. The coefficient of friction is 0.25. Determine width of belt. **07**
- OR**
- (b) Derive a relation for minimum number of teeth on gear wheel and the pinion to avoid interference. **07**
- Q.3** (a) Define the term with figure. (1) Pitch circle (2) Pitch diameter (3) Pitch point (4) Circular pitch (5) Module. **07**
- (b) How do the effect of gyroscopic couple and centrifugal force make the rider of a two wheeler to tilt on one side? Derive a relation for the limiting speed of vehicle. **07**
- OR**
- Q.3** (a) The turbine rotor of a ship has a mass of 2.2 tonnes and rotates at 1800 rpm clockwise when viewed from aft. The radius of gyration of rotor is 320 mm. Determine the gyroscopic couple and its effect when
- (1) The ship turns at a radius of 250 m with a speed of 25 km/h.
 - (2) The ship pitched with the blow rising at an angular velocity of 0.8 rad/s .
 - (3) The ship rolls at an angular velocity of 0.1 rad/s
- (b) What are quick return motion mechanisms? Where they are used? Discuss the functioning of any one of them. **07**

- Q.4 (a)** In the toggle mechanism as shown in fig(1). the crank OA rotates at 210 rpm counter clockwise increasing at the rate of 60 rad/s^2 . For the given configuration, determine **07**
- (1) Velocity of slider D and the angular velocity of link BD.
 - (2) Acceleration of slider D and angular acceleration of link BD.
- (b)** Derive an expression for the frequency of free torsional vibrations for a shaft fixed at one end and carrying a load on the free end. **07**

OR

- Q.4 (a)** Define the terms vibration isolation and transmissibility. Explain with the help of transmissibility Vs. frequency ratio curves at various damping ratio. **07**
- (b)** Four masses A,B,C and D are attached to a shaft and revolve in the same plane. The masses are 12 kg, 10 kg, 18 kg, and 15 Kg respectively and their radii of rotations are 40 mm, 50 mm, 60 mm, and 30 mm. The angular position of masses B,C, and D are 60° , 135° and 270° from mass A. Find the magnitude and position of balancing mass at radius of 100 mm. **07**

- Q.5 (a)** Describe Pantograph and what are its use? Describe with a neat sketch the principle and working of pantograph. **07**
- (b)** Mechanism as shown in fig.(2) has the following dimensions: OA= 200mm, AB= 1.5m, BC = 600mm , CD = 500 mm and BE = 400 mm. Locate all instantaneous centers. If crank OA rotates at uniformly at 120 rpm clockwise. Find (1) The velocity of B , C and D (2) The angular velocity of link AB, BC and CD. **07**

OR

- Q.5 (a)** In reverted Epicyclic gear train the arm A carried two gears B and C and a compound gear D-E. The gear B meshes with gear E and gear C meshes with gear D. The number of teeth on gear B,C, and D are 75, 30 and 90 respectively. Find the speed and direction of gear C when gear B is fixed and arm A makes 100 rpm clockwise. **07**
- (b)** Define the following terms with neat sketch ; (1) Base circle (2) Pitch circle (3) Pressure angle (4) Stroke of follower. (5) Pitch point. **07**

Fig.(1) Q-4 (a)

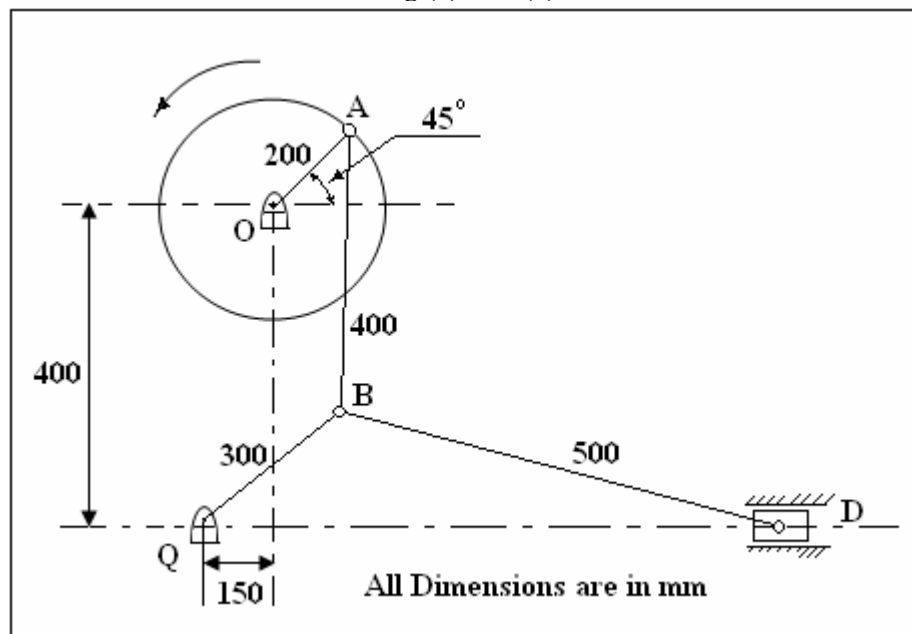


Fig (2) Q-5 (b)

