

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC - SEMESTER-II • EXAMINATION – SUMMER • 2014

Subject Code: X21902**Date: 24-06-2014****Subject Name: Kinematics 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)** Explain with sketches any two inversions of single slider crank mechanism. **07**
(b) Explain the term slip and creep in a belt drive. **07**

- Q.2 (a)** Write a short note on rope brake dynamometer. **07**
(b) Write a short note on Davis steering gear mechanism. **07**

OR

- (b)** Name the different mechanisms which give the exact straight line motion and explain any one in detail. **07**

- Q.3 (a)** Define (any seven) **07**
 (1) Pitch circle (2) addendum (3) module (4) backlash (5) circular pitch (6) pressure angle (7) under cutting (8) helix angle (9) pitch cones of bevel gears.
(b) In mechanism shown in figure 1 OA rotates uniformly at 120 rpm clockwise. OA is 200 mm long, AB is 1500 mm long, BC is 600 mm long, CD is 500 mm long, the distance BE is 400 mm and the distance OE is 1350 mm. Find for the given configuration angular velocity of the links AB, BC and CD. **07**

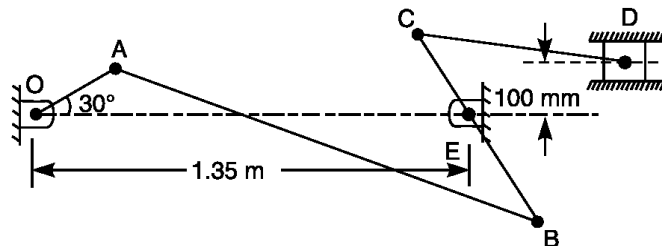


Figure 1

OR

- Q.3 (a)** Derive analytical expression of velocity and acceleration of piston of a single slider mechanism having a crank rotating with uniform velocity. **07**
(b) In slider crank mechanism the length of stroke is 300 mm and length of connecting rod is 600 mm. When piston is travelled 80 mm from inner dead center position, find the angular position of crank and velocity and acceleration of piston. The engine speed is 240 rpm clockwise. **07**

- Q.4 (a)** Derive the expression for length of belt for open belt drive. **07**
(b) A vee belt, while running into a 45° grooved pulley, is developing 180° angle of lap with it. Its cross sectional area is 7 cm^2 . Density of the belt material is 1.37 gm/cm^3 and the maximum stress in the belt is limited to 3 MPa. Assuming the coefficient of friction to be 0.2, find the maximum power that can be transmitted and corresponding speed of belt. **07**

OR

- Q.4 (a)** Compare the involute and cycloidal tooth profiles. **07**
- Q.4 (b)** An epicyclic gear train shown in figure 2 is consist of a sun wheel S, a stationary internal gear E and three identical planet wheels P carried on a star shaped planet carrier C. the size of different toothed wheels are such that planet carrier C rotates at $1/5^{\text{th}}$ of the speed of the sun wheel S. the minimum number of teeth on any wheel is 16. The driving torque on sun wheel is 100 Nm. Determine numbers of teeth on different wheels of the train and torque necessary to keep the internal gear stationary. **07**

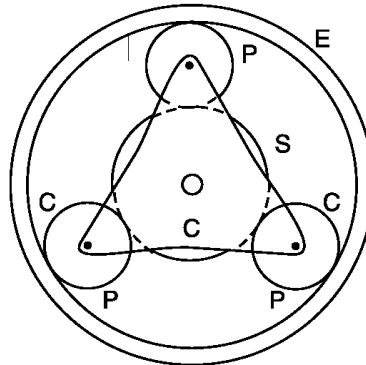


Figure 2

- Q.5 (a)** With the help of neat sketches explain the various types of cams and followers. **07**
- (b)** Draw a profile of a cam rotating at uniform speed and required to give uniform velocity motion to the knife edge follower. Lift of the follower is 30 mm. Angle of rise is 90° . Angle of return is 120° . Dwell between rise and return is 75° . The minimum radius of cam is 50 mm and cam rotates in clockwise direction. **07**
- OR**
- Q.5 (a)** Derive equation of torque required to overcome friction between shaft and bearing surface in flat pivot bearing by uniform pressure theory assumption. **07**
- (b)** Find the force required to be applied at the end of 500 mm long lever of a screw jack. Also find efficiency of screw jack. The threads are single start square with 12 mm pitch and 65 mm mean diameter. The load does not rotate with screw spindle. The coefficient of friction for threads and collar is 0.15. The collar have 40 mm mean radius. Load to be lifted is 8 kN. **07**
