Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–II • EXAMINATION – WINTER • 2014

Subject Code: X21902 Date: 30-12-2014

Subject Name: Kinematics of Machines

Time: 02:30 pm - 05:00 pm Total Marks: 70

Instructions:

1. **Attempt any five questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Explain in detail the following terms: (Any FOUR) **07**

a) Friction
b) Diametral pitch
c) Pressure angle
d) Prime circle
e) Centrifugal Tension

(b) Discuss relative merits and demerits of belt, rope and chain drive for power transmission. **07**

Q.2 **(a)** Explain Klein's construction method with neat sketch. **07**

(b) In a four bar chain ABCD, AD is fixed and is 150 mm long. The crank AB is 40 mm long and rotates at 100 rpm clockwise, while the link CD = 80 mm oscillates about D. BC and AD are of equal length. Find the angular velocity of link CD when angle BAD = 60°. **07**

Q.3 **(a)** Classify gear trains. Give suitable application of each type of gear train. Explain with neat sketch sun and planet type gear. **07**

(b) In an epicyclic gear train, the internal wheels A and B and compound wheels C and D rotate independently about an axis O. The wheels E and F rotate on pins fixed to the arm G. E gears with A and C and F gears with B and D. All the wheels have the same module and the number of teeth are: T_C=28; T_D=26; T_E = T_F=18. **07**

Conclude the following:

1. Sketch the arrangement;
2. Find the number of teeth on A and B;
3. If the arm G makes 100 rpm clockwise and A is fixed, find the speed of B;
4. If the arm G makes 100 rpm clockwise and wheel A makes 10 rpm in anticlockwise; find the speed of B.

Q.4 **(a)** Explain single plate clutch with neat sketch. **07**

(b) The mean diameter of a square threaded screw jack is 50 mm. The pitch of the thread is 10 mm. What force must be applied at the end of a 0.7 m long lever, which is perpendicular to the longitudinal axis of the screw to raise the load of 20 kN and to lower it? Take $\mu = 0.15$. **07**

Q.5 **(a)** With the help of neat sketches explain the types of cams and followers. **07**

(b) Draw the profile of a cam operating a roller follower from the following data : **07**
Least radius of cam 25 mm;
Lift angle = 120°;
Fall angle = 150°;
Lift of follower = 40 mm;
Roller dia. = 25 mm;
Cam shaft diameter = 40 mm;
Cam motion during lift= S.H.M.;
Cam motion during fall = uniform acceleration & deceleration;
Number of pauses are two of equal intervals between motions.
The speed of camshaft is uniform. The line of stroke of the follower is off-set 12.5 mm from the center of cam.

Q.6 **(a)** Derive expression for the length of an open belt drive. **07**

(b) Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1.95 m apart and are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt when the larger pulley rotates at 200 rpm, if the maximum permissible tension in the belt is 1 kN, and the coefficient of friction between the belt and pulley is 0.25? **07**

Q.7 **(a)** With neat sketch of the straight line motion 'Hart mechanism', prove that it produces an exact straight line motion. **07**

(b) What is inversion of mechanism? Explain oscillating cylinder engine with neat sketch. **07**

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