

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-IV(NEW) – EXAMINATION – SUMMER 2019

Subject Code:2142504

Date:25/05/2019

Subject Name: Theory of Machines

Time:02:30 PM TO 05:00 PM

Total Marks: 70

Instructions:

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

	MARKS
Q.1 (a) Define following terms: (i) Completely constrained motion (ii) Mechanism (iii) Inversion of a mechanism	03
(b) Draw pantograph mechanism with proportions of links shown and state its applications.	04
(c) Enlist various straight line mechanisms and prove that Peaucellier mechanism is a straight line mechanism.	07
Q.2 (a) Explain: Velocity of rubbing	03
(b) Discuss the procedure to draw velocity diagram for single slider crank mechanism.	04
(c) Explain Ackerman steering gear mechanism with neat sketch, advantages and drawbacks.	07
OR	
(c) Derive an expression for the ratio of shafts velocities for hook's joint and explain the polar diagram.	07
Q.3 (a) Explain following terms in context to kinematic synthesis: (1) Function Generation (2) Structural Error (3) Precision points	03
(b) What is kinematic synthesis of mechanisms? Derive Freudenstein's equation.	04
(c) Describe a step by step procedure for the synthesis of slider crank mechanism using 3 precision points.	07
OR	
Q.3 (a) State different belt materials and their specific applications.	03
(b) Sketch and explain any one inversion of a double slider crank chain.	04
(c) The number of teeth on each of the two equal spur gears in mesh is 40. The teeth have 20° involutes profile and the module is 6 mm. If the arc of contact is 1.75 times the circular pitch, find the addendum.	07
Q.4 (a) Enlist different types of gear train. Explain compound gear train with neat sketch.	03
(b) Explain Klein's construction with an example.	04
(c) A single plate clutch, with both sides effective, has outer and inner diameters 300 mm and 200 mm respectively. The maximum intensity of pressure at any point in the contact surface is not to exceed 0.1 N/mm ² . If the coefficient of friction is 0.3, determine power transmitted by a clutch at a speed 2500 r.p.m.	07
OR	
Q.4 (a) Explain the terms in relation to gears:	03
(i) Addendum (ii) Backlash (iii) Pressure angle	
(b) Write a short note on gear drives giving their merits and demerits.	04

- (c) Name the different types of clutches. Describe with the help of neat sketches the working principles of two different types of friction clutches. 07

Q.5 (a) Explain the ‘fast and loose pulley’ with the help of a neat sketch. 03

(b) Discuss the term interference in relation to gear. 04

(c) A cam with a minimum radius of 25 mm is to be designed for a flat face reciprocating follower. Information available is as follows: (a) Rise of the follower through 20 mm during 120° of cam rotation, (b) Dwell for next 30° of the cam rotation (c) Descending of the follower during the next 120° of cam rotation (d) Dwell during rest of the cam rotation. Draw the profile of the dam if the ascending and descending of the cam is with simple harmonic motion. 07

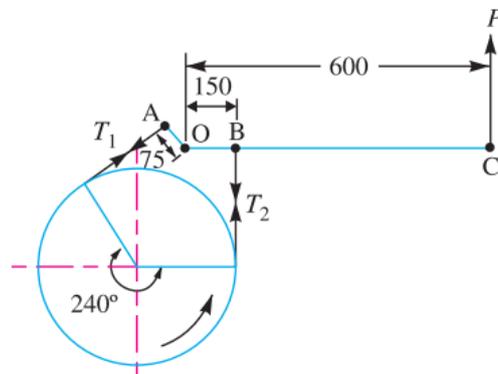
OR

Q.5 (a) Define the following terms in relation with cams and followers: 03

(i) Conjugate cam (ii) Pressure angle (iii) Dwell

(b) Enlist 4 different types of follower motions stating a typical application of each. 04

(c) A differential band brake, as shown in Fig.1, has a drum diameter of 600 mm and the angle of contact is 240° . The brake band is 5 mm thick and 100 mm wide. The coefficient of friction between the band and the drum is 0.3. If the band is subjected to a stress of 50 MPa, find : 1. The least force required at the end of a 600 mm lever, and 2. The torque applied to the brake drum shaft. 07



All dimensions in mm.

Figure-1
