

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III (NEW) EXAMINATION – WINTER 2017

Subject Code: 2131906

Date: 29/11/2017

Subject Name: Kinematics of Machines

Time: 10:30 AM to 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) Define: Kinematic link, Kinematic pair, Kinematic chain. **03**
 - (b) Explain the term: Lower pair, Higher pair, Kinematics, Inversion. **04**
 - (c) Explain various inversion of a slider crank mechanism with the help of examples. **07**
- Q.2**
- (a) Explain the types of instantaneous centers. **03**
 - (b) Explain function generation, path generation and motion generation. **04**
 - (c) Derive the expression for the magnitude and direction of coriolis component of acceleration. **07**

OR

- (c) Explain freudenstein's method of three point synthesis of mechanism. **07**
- Q.3**
- (a) What is straight line motion mechanism? Give its classification. **03**
 - (b) Sketch Davis steering mechanism and discuss its advantages and disadvantages. **04**
 - (c) Derive the equation for finding out the ratio of angular velocity of two shafts of Hook's joint. **07**

OR

- Q.3**
- (a) What is contact ratio? Explain its significance. **03**
 - (b) Define: Module, Circular pitch, Diametral pitch, Addendum. **04**
 - (c) Derive an expression for finding out the length of path of contact in a pair of meshed spur gear. **07**
- Q.4**
- (a) Enlist different types of gear train. Explain compound gear train with neat sketch. **03**
 - (b) Explain with a neat sketch the "Differential Gear Box". **04**

- (c) Two gear wheels of 10 cm and 15 cm pitch diameters have involute teeth of 1.6 diametral pitch and pressure angle 20° . The addenda are 3 mm. determine: (1) Length of path of contact (2) Contact ratio (3) Angle turned by pinion, while any pair of teeth in contact. **07**

OR

- Q.4 (a) Define the terms related to cam: Base circle, Pitch circle, Pressure angle, Stroke of the follower. **04**

- (b) Draw the cam profile for a disc cam and knife edge follower from the following data for one revolution of cam. **10**

(1) Angle of rise= 60° (2) Follower lift=40 mm with uniform velocity (3) Angle of dwell = 30° (4) Angle of fall= 60° where follower moves with uniform velocity (5) For remaining period of 210° the follower remains in same position (6) Diameter of base circle of cam= 50 mm.

- Q.5 A crank and rocker mechanism ABCD has the following dimensions. **14**

AB=0.75 m, BC=1.25 m, CD=1 m, AD=1.5 m. E is the mid point of the coupler link BC. AD is the fixed link. Crank AB has an angular velocity of 20 rad/s counter clockwise and deceleration of 280 rad/s^2 at the instant angle $\text{DAB}=60^{\circ}$. Find

1. Instantaneous linear velocity and acceleration of midpoint E of link BC.
2. Instantaneous angular velocity and acceleration of link CD.

OR

- Q.5 (a) Explain reverted gear train with neat sketch. **04**

- (b) A cam is to be designed for a knife edge follower with the following data: (1) Cam lift=40 mm during 90° of cam rotation with SHM (2) Dwell for the next 30° (3) During the next 60° of the cam rotation, the follower returns to its original position with uniform velocity. (4) Dwell during the remaining 180° . **10**

Draw the profile of the cam when the line of stroke of the follower passes through the axis of the cam shaft. The radius of the base circle of the cam is 40 mm.
