Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY ME- SEMESTER II– EXAMINATION – SUMMER 2015

Subject Code: 2720910 Subject Name: Advanced Mechanism Design Time: 2:30 PM – 5:00 PM Instructions:

Date: 26/05/2015

Total Marks: 70

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- Q.1 (a) Write Grueblerøs equation for planar mechanism. Find out degrees of freedom of 07 mechanism as shown in Fig. 1





- (b) What do you understand by kinematic pair?Differentiate the following:(1) Synthesis and analysis
 - (2) Motion generation and function generation
 - (3) Fixed centrode and Moving centrode
- Q.2 (a) Solve the problem by instantaneous center method. Fig. 2 represents a shaper 07 mechanism. For the given configuration, what will be the velocity of the cutting tool at S and the angular velocities of the links AR and RS. Crank OP rotates at 10 rad/s.
 - (b) In a pump mechanism shown in fig. 3, OA=320 mm, AC=680 mm and OQ= 650 07 mm. The crank OA rotates at 20 rad/s clockwise. Determine the
 - i) Angular velocity of the cylinder
 - ii) Sliding velocity of the plunger
 - iii) Absolute velocity of plunger







07

- (b) PQRS is a four bar chain with link PS fixed. The lengths of links are PQ=62.5 07 mm, QR=175 mm, RS=112.5 mm and PS=200 mm. The crank PQ rotates at 10 rad/s clockwise. Draw the velocity and acceleration diagram when angle QPS=60° and Q and R lie on the same side of PS. Find the angular velocity and angular acceleration of links QR and RS.
- Q.3 (a) Explain Bobillier construction as a graphical method by which inflection circle 07 can be drawn without requiring the curvature of the centrodes.
 - (b) Define the term cubic of stationary curvature. Explain one graphical method to 07 draw it.

OR

- Q.3 (a) Explain Hartmann construction as a graphical method to find the location of 07 center of curvature of the locus of a moving point.
 - (b) Explain Euler Savary equation for location of the conjugate point. 07
- Q.4 (a) Explain interrelated phases of synthesis process. Differentiate approximate and 07 exact synthesis.
 - (b) List different categories of two position synthesis. Write a step by step procedure for 07 Grashof 4-bar linkage with rocker as output as shown in Fig. 4 to move link CD from position C_1D_1 to C_2D_2 .



OR

- Q.4 (a) A 4-bar linkage is required to generate a function $y=x^{1.6}$ for 1 Öx Ö3. The crank 07 rotates from an angle 60° to 120° whereas the follower rotates from an angle 60° to 150°. Use three accuracy points approximation based on Chebychev spacing.
 - (b) State Roberts Chebyshev (cognate) theorem. Mention applications of cognates. 07 Draw Cayley diagram to find cognates of fourbar linkage.
- Q.5 (a) Explain in detail õD-H representation of forward kinematicsö. 07
 - (b) Explain analytical synthesis of four bar function generation. 07

OR

- Q.5 (a) Explain DH- parameters associated with each link using neat sketch. Develop DH 07 parameter table for 2DOF robotic arm as shown in fig. 5
 - (b) Formulate the forward kinematics model of the three degree of freedom (RPP) 07 manipulator arm as shown in fig. 6

