

[6579]-420

T.E. (Robotics and Automation) (In-Sem)
ROBOT KINEMATICS AND DYNAMICS
(2019 Pattern) (Semester - I) (311503 (A))

Time : 1 Hour]

[Max. Marks : 30

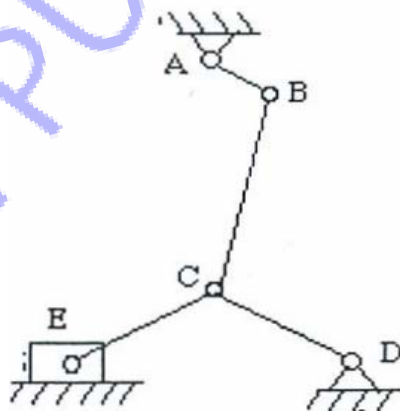
Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Use of Calculator is allowed.*
- 4) *Assume Suitable data if necessary.*

- Q1)** a) Synthesize a four bar mechanism to generate a function $y = x^2 - 10$ for $2 \leq x \leq 7$ at three precision points. The crank rotates from an angle 40° to 100° , whereas the follower link rotates from an angle of 50° to 120° . Assume the length of the fixed link as 50 mm. [9]
- b) Explain inversions of four bar mechanism. [6]

OR

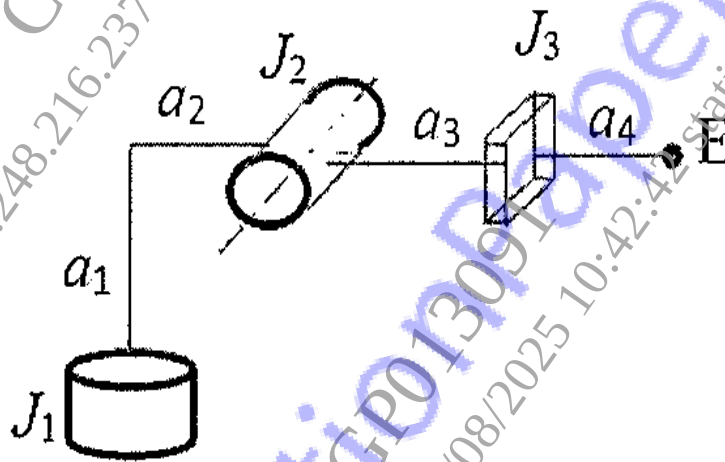
- Q2)** a) What do you mean by coupler curves? Explain the analysis of coupler curves for slider crank mechanism. [9]
- b) Determine the degree of freedom of following mechanism. [6]



- Q3)** a) Prepare the DH parameter table for cylindrical robot and hence obtain the equations for x , y , z coordinates of end effector. [9]
- b) Write short note on: Forward kinematic analysis of SCARA robot. [6]

OR

- Q4)** a) Obtain the DH parameters for the robot configuration shown in Fig. below. Also determine the position of end effector (E) if the link lengths are: $a_1=200$, $a_2=100$, $a_3=75$ mm, and $a_4=90$ mm and the joint parameter values for the joints J_1 , J_2 and J_3 are 50° , 30° and 70° mm respectively. [9]



- b) What are Denavit-Hartenberg (DH) parameters? Explain the steps to determine these parameters. [6]

