Total No. of Questions : 4]

SEAT No. :

PC114

[Total No. of Pages : 2

[6063]-120

T.E. (Robotics & Automation) (Insem)

ROBOT KINEMATICS & DYNAMICS

(2019 Pattern) (Semester - I) (311503A)

Time : 1 Hour] *[Max. Marks : 30*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) What do you understand by coupler curve? How will you generate coupler curve using Freudenstein equation? **[9]**

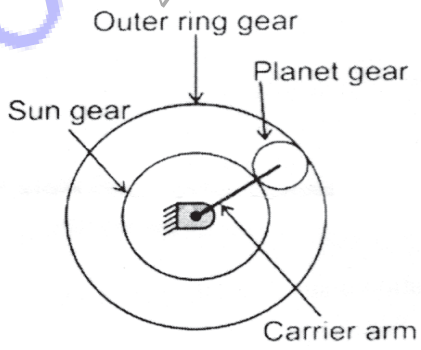
b) Draw neat sketches and explain applications of following types of cams: **[6]**

i) Cylindrical cam
ii) Disc cam
iii) Wedge cam

OR

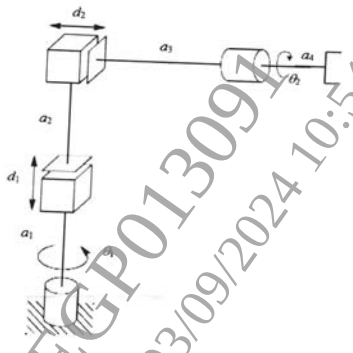
Q2) a) In a four bar mechanism ABCD, the link AD is the fixed link and the dimensions of various links are: AB=50 mm, BC=100 mm, CD=150 mm, and AD=180mm. For 40° inclination of input link AB, determine the angular displacement of output link CD. **[9]**

b) In an epicyclic gear train as shown in Fig., the Sun gear (S) has 60 teeth and rotates at 200 rpm, Ring gear (A) has 100 teeth and is held stationary. Determine the speed of the arm. **[6]**



P.T.O.

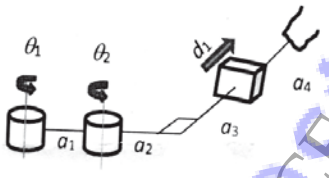
Q3) a) Obtain the DH parameters for the robot configuration shown in Fig. below. Also determine the position of end effector if the link lengths are: a_1 =160, a_2 =150, a_3=200 mm, and a_4 =50 mm and the joint parameters are: $\theta_1 = 35^o, \theta_2 = 45^o, d_1 = 40$ mm, and $d_2 = 20$ mm. **[9]**



b) With neat sketch, explain the forward kinematics of spherical robot using 3D transformation method. **[6]**

OR

Q4) a) Obtain the DH parameters for the robot configuration shown in Fig. below. Also determine the position of end effector if the link lengths are: a_1 =100, a_2 =120, a_3=140 mm, and a_4 =80 mm and the joint parameter values are θ_1 = 30°, θ_2 = 60° and d_1 = 20mm. **[9]**



b) Derive an expression for homogeneous transformation matrix for DH parameters. **[6]**

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