

Total No. of Questions : 8]

SEAT No. :

P9186

[Total No. of Pages : 2

[6179]-315

**S.E. (Robotics and Automation)**  
**COMPUTER GRAPHICS FOR ROBOTICS**  
**(2019 Pattern) (Semester-IV) (211512)**

Time : 2½ Hour]

[Max. Marks : 70

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) For the following data, use Lagrange method to determine y at x=4 on a curve which is generated by using 4 data points having following co-ordinates:[9]

x	2	3	8	10
y	1	7	5	9

b) A point (4,2,1) is rotated by 45° using a quaternion coincident with y axis. Determine the transformed position of the point. [8]

OR

Q2) a) With suitable examples explain any two methods of 2D interpolation. [8]

b) For the data given below, use inverse distance weighting method to determine z at x=3 and y=12 [9]

x	1	4	5	8
y	12	10	11	14
z	1	5	4	6

Q3) a) A line with end point (3,2,0) and (4,1,0) is simultaneously revolved about x-axis by 360° and translated along x-axis by 50 units to generate sweep surface. Obtain the point on this sweep surface for t=0.4 and s=0.1. Where t is parameter for line and s is parameter for revolution and translation. [10]

b) What are B-spline curves? How the geometric continuity is determined for B spline curves? [7]

OR

- Q4)** a) Obtain x-y co-ordinates of a point on cubic spline curve at parameter value  $t=0.3$  considering control points as (4,6), (6,2), (10,7) and (12,6) for second segment. [10]
- b) Determine the point of Bezier curve at  $t=0.6$  for three control points :  $P_0$  (2,3),  $P_1$ (6,5),  $P_2$  (8,1) [7]

- Q5)** a) Determine the point of intersection of the line AB having endpoints: A (2,1,-4) and B (1, -3, 2) with plane  $x + 4y - z = 8$  [10]
- b) What is analytic geometry? Explain its application in robotics. [8]

OR

- Q6)** a) Write note on : Intersection of a circle with a straight line. [10]
- b) Determine the angle between a line  $L=i-j+3k$  and a plane  $x+2y-3z=10$  [8]

- Q7)** a) Show that the multiplication of basis blades  $e_3$  and  $e_{13}$  is  $-e_1$ . [9]
- b) Demonstrate with example, the outer product of 2 vectors in 3 dimensional space. [9]

OR

- Q8)** a) Write a note on reflection vector and discuss its applications. [9]
- b) Obtain the table containing all basis blades in 3 dimension. [9]

