Total No. of Questions : 8]

SEAT No. :

PE4341

[Total No. of Pages : 3

[6582]-115

S.E. (Robotics & Automation Engineering)

COMPUTER GRAPHICS FOR ROBOTICS

(2019 Pattern) (Semester - IV) (211512)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

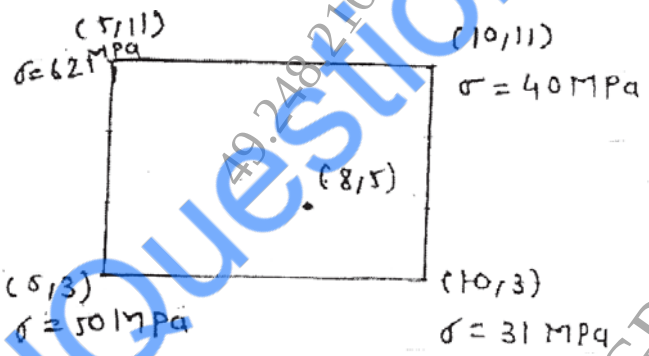
1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Find the value of y at x = 0 given some set of values (–2, 5), (1, 7), (3, 11), (7, 34) by using Lagrange Interpolation Formula. **[9]**

b) Explain the application of Inverse distance weighting method for surface generation. **[8]**

OR

Q2) a) Explain the application of quaternions to obtain the combined roll, pitch and yaw motion of a robot gripper. **[9]**



b) Determine stress at point (8, 5) By using **[8]**

i) IDW method (Inverse distance weighting method)

ii) Shape function

P.T.O.

Q3) a) Explain the applications of B spline and Bezier curves in robot path planning. **[7]**

b) Obtain x, y, and z co - ordinate of point on the quadratic Bazier surface patch at u = 0.6 and v = 0.2 using following control points : **[10]**

$$\begin{bmatrix} (-15\ 0\ 15) & (-15\ 5\ 5) & (-15\ 5\ -15) & (-15\ 0\ -15) \\ (-5\ 5\ 15) & (-5\ 5\ 5) & (-5\ 5\ -15) & (-5\ 5\ -15) \\ (5\ 5\ 15) & (5\ 5\ 5) & (5\ 5\ -5) & (5\ 5\ -15) \\ (15\ 0\ 15) & (15\ 5\ 5) & (15\ 5\ -5) & (15\ 0\ -15) \end{bmatrix}$$

OR

Q4) a) What are B-spling curves? How the geometric continuity is determined for B spline curves? **[7]**

b) Find the midpoint (i.e. point at parameter t = 0.5) of a Hermite cubic spline with two end points as (2, 2) and (7, 6) and corresponding tangent vectors as (1, 5) and (5, 1). **[10]**

Q5) a) A plane contains vectors $a = i + 3j + 4k$ and $b = 0i + 5j + 2k$. A point in the plane is (3, 5, 2). Obtain the equation of plane. **[10]**

b) Write note on: Application of analytic geometry in robotics. **[8]**

OR

Q6) a) Suppose, we have a $\Delta P_1P_2P_3$ and one point is present. To analyse the location of point whether it is inside of Δ, outside of Δ in vertere or at edge for calculation, **[10]**

We will find, $A\Delta(P_1P_2P_i)$, $A\Delta(P_2P_3P_i)$ $A\Delta(P_3P_1P_i)$.

The calculations are in counter clockwise manner

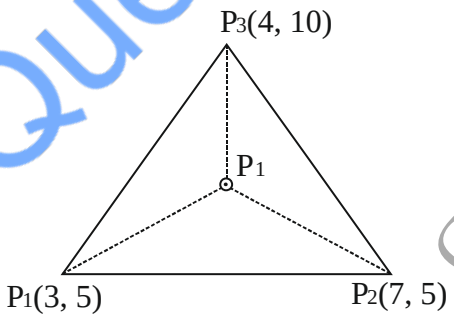
Check the following points

i) (5, 7)

ii) (5, 4)

iii) (6, 5)

iv) (4, 10), for $(P_1 - P_2 - P_i)$, $(P_2 - P_3 - P_i)$, $P_3 - P_1 - P_i)$



b) Write note on : Intersection of a circle with a straight line. **[8]**

Q7) a) Show that the multiplication of basis blades e_{12} and e_{13} is $-e_{23}$. **[9]**

b) Explain the applications of applied geometric algebra for modeling of robotics physics. **[9]**

OR

Q8) a) What do you mean by an other product? What are the properties of outer product? **[9]**

b) Write short note on : Reflection and rotation. **[9]**

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