

**VIT**

Vellore Institute of Technology

Course: B. Tech (ECE)

Class NBR: VL2023240102308,
VL2023240102311

Course Mode: CBL

Faculty: Dr. M. Islam,
Dr. T. K. Das

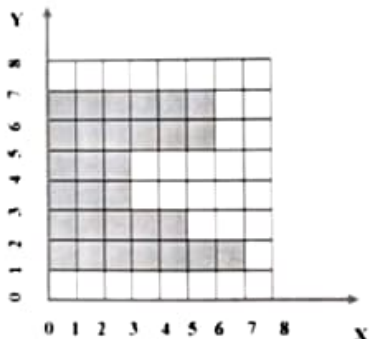
Course Type: TH

Slots: C2+TC2

Max. Marks : 50M

Duration : 90 Minutes

Answer All Questions

Q. No	Questions	Max. marks	CO	BL
Q. 1.	Apply split and merge technique to segment the 8×8 image as illustrated in Figure 1. The logical predicative $P(R_i) = \text{TRUE}$, when all the pixels in the region R_i have the same intensity. Give the result after each split and merge step. Draw the Quad Tree diagram.  Figure 1	[10]	3	3
Q. 2.	For the schematic figure as shown in Figure 2, determine the following parameters. a) Centroid; b) Minimum aspect ratio; c) Thinness; d) Compactness  Figure 2	[10]	3	3
Q. 3.	a) If the coordinate frame $O_1X_1Y_1Z_1$ is obtained from the coordinate frame $O_0X_0Y_0Z_0$ by a rotation of 90° about the X-axis followed by a rotation of -90° about the fixed Y-axis, find the rotation matrix R representing the composite transformation. Sketch the initial and final frames. b) Obtain the rotation matrix R_B^A for the frames given in Figure 3.	[7] [3]	4	4

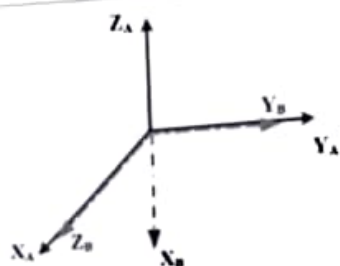


Figure 3

Q. 4. Consider the following rotation matrix R :

$$R = \begin{bmatrix} A & 0.433 & -0.866 \\ 0.433 & -0.75 & B \\ -0.866 & C & 0 \end{bmatrix}$$

a) Find the values of A, B and C

[7.5]

b) Verify that the obtained matrix is a rotation matrix within some rounding errors

[2.5]

Q. 5. a) Are the Euler angles same as Roll-Pitch-Yaw angles? Justify your comment.

[2]

b) Find the rotation matrix corresponding to the Z-Y-Z Euler angles $\varphi = \frac{\pi}{2}$; $\theta = 0$, and $\psi = \frac{\pi}{4}$.

[6]

c) List all possible sets of Euler angles. Is it possible to have Z-Z-Y Euler angles?

[2]