



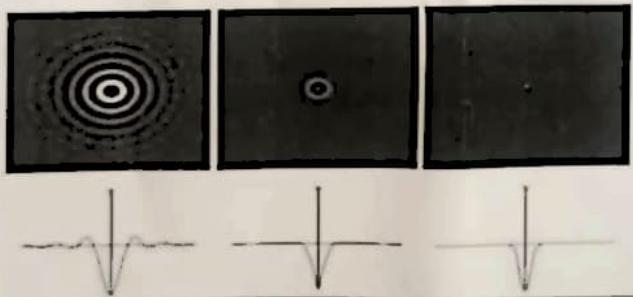
SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
CONTINUOUS ASSESSMENT TEST - II
WINTER SEMESTER 2025-2026

SLOT: F2 + TF2

Programme Name & Branch : B.Tech & Computer Science and Engineering
Course Code and Course Name : BCSE403L and Digital Image Processing
Faculty Name(s) : Prof. S.L. Aarthi & Prof. G. N. Balaji
Class Number(s) : VL2025260502054,2055
Date of Examination : 22.03.2026
Exam Duration : 90 minutes Maximum Marks: 50

Answer All Questions

- M - Max mark; CO - Course Outcome; BL - Blooms Taxonomy Level (1 - Remember, 2 - Understand, 3 - Apply, 4 - Analyse, 5 - Evaluate, 6 - Create)
- CO2: Acquire the knowledge of various image transforms and image enhancement techniques involved.
- CO3: Demonstrate image restoration process and its respective filters required and attain the knowledge of color image processing techniques.
- CO4: Experiment the various image segmentation and morphological operations for a meaningful partition of objects.

Q. No	Question	M	CO	BL
1.	You have a choice to use an Ideal high pass, Butterworth high pass or a Gaussian high pass filter for filtering an image to extract edges and finely grained texture. (a) Which one will you use especially if you have to keep D. (distance measured from the origin of frequency rectangle) small and why? (b) If you are restricted to use Butterworth high pass filter will you choose a higher order filter or lower order filter, Justify your answer with suitable derivation. 	10	2	2
2.	Consider the following 4×4 grayscale image block: $X = \begin{bmatrix} 8 & 12 & 6 & 10 \\ 10 & 14 & 4 & 8 \\ 2 & 6 & 16 & 20 \\ 4 & 8 & 18 & 22 \end{bmatrix}$ Perform a Level-1 2-D Haar Wavelet decomposition of the above image by first applying the row-wise transform and then the column-wise transform, showing all intermediate calculations clearly. From the final transformed matrix, identify the four subbands (LL, LH, HL, HH). Further, if all HH coefficients are set to zero	10	2	3



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	before reconstruction, explain what type of visual effect will appear in the reconstructed image and justify your answer mathematically.																																																			
3.	a) Segment the given image using region growing algorithm. Use the points marked in the image as seed points and assume the threshold value as 1. (6 marks) $f(x,y) =$ <table border="1" style="border-collapse: collapse; text-align: center; margin: 0 20px;"> <tr><td>5</td><td>6</td><td>1</td><td>1</td><td>1</td><td>0</td><td>①</td></tr> <tr><td>6</td><td>7</td><td>7</td><td>1</td><td>1</td><td>1</td><td>6</td></tr> <tr><td>3</td><td>⑥</td><td>7</td><td>7</td><td>7</td><td>6</td><td>5</td></tr> <tr><td>4</td><td>3</td><td>7</td><td>7</td><td>7</td><td>5</td><td>3</td></tr> <tr><td>3</td><td>3</td><td>2</td><td>1</td><td>③</td><td>3</td><td>4</td></tr> <tr><td>2</td><td>2</td><td>1</td><td>2</td><td>1</td><td>2</td><td>3</td></tr> <tr><td>1</td><td>1</td><td>①</td><td>1</td><td>1</td><td>2</td><td>2</td></tr> </table> b) Write the characteristics of image segmentation process (4 marks)	5	6	1	1	1	0	①	6	7	7	1	1	1	6	3	⑥	7	7	7	6	5	4	3	7	7	7	5	3	3	3	2	1	③	3	4	2	2	1	2	1	2	3	1	1	①	1	1	2	2	10	3
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4.	Consider the following binary image A and structuring element B $A = \begin{bmatrix} 0 & 1 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 0 \end{bmatrix}$ $B = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$ Perform the erosion and dilation of image A using structuring element B, clearly showing all intermediate steps. Then compute the opening of A by B. Finally, explain what structural changes occur in the image after the opening operation and how the shape of the structuring element influences the result.	10	3																																																	
5.	A 256×256 grayscale image is observed to have 7,800 pixels with intensity value 0 and 5,200 pixels with intensity value 255, while the remaining pixels show small random fluctuations around their original values; in a separate analysis, the number of noisy pixels per image follows the probability distribution $P(0) = 0.135, P(1) = 0.270, P(2) = 0.270, P(3) = 0.180, P(4) = 0.090$. Based on this information, determine whether the image is affected by impulse (salt & pepper) noise, Gaussian noise, or Poisson noise, compute the probability that a pixel is corrupted, identify the distribution with necessary parameters, finally justify which filtering technique would be most appropriate for restoration.	10	4																																																	