Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

REG.NO.:

SLOT: F1+TF1

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

Programme Name & Branch	**: B.Tech (Computer Science)**
Course Code and Course Name	**: BCSE403L, Digital Image Processing**
Faculty Name(s)	**: Prof. Anisha M. Lal, Prof. Natarajan P**
Class Number(s)	**: 2053, 2423**
Date of Examination	**: 22-03-2026**
Exam Duration	**: 90 minutes**

General instruction(s): **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)

Course Outcomes:

2. Acquire the knowledge of various transforms and image enhancement techniques involved.
3. Demonstrate image restoration process and its respective filters required and attain the knowledge of color image processing techniques.
4. Experiment the various image segmentation and morphological operations for a meaningful partition of objects.

<table>
<tr><th>Q. No</th><th>Question</th><th>M</th><th>CO</th><th>BL</th></tr>
<tr><td>1.</td><td>Design a high emphasis filter using Gaussian filter which attenuates low frequency components for the image given below with $D_o = 2.5$, $k_1 = 1$, $k_2 = 2$
F(u,v) =
<table>
<tr><td>76 + 0j</td><td>-3.5 + 0.8j</td><td>-3.5 - 0.8j</td><td>-3.5 + 0.8j</td><td>-3.5 - 0.8j</td></tr>
<tr><td>-12.5 + 2.6j</td><td>-1 + 3.4j</td><td>-2 + 1.7j</td><td>-1 + 3.4j</td><td>-2 + 1.7j</td></tr>
<tr><td>-12.5 - 2.6j</td><td>-2 - 1.7j</td><td>-1 - 3.4j</td><td>-2 - 1.7j</td><td>-1 - 3.4j</td></tr>
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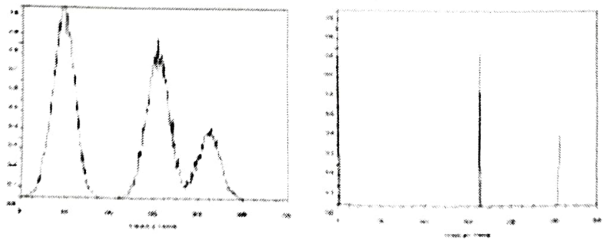
</table></td><td>10</td><td>CO2</td><td>BL3</td></tr>
<tr><td>2.</td><td>a) Identify the type of noises given in Figure 1 and 2 and depict the PDF for the same. (5 marks)
Figure 1 and 2
 
b) A pixel neighbourhood is affected by Gaussian noise and impulse noise (salt-and-pepper). The observed values are: [50,52,49,200,51,48,250,50,49]. Apply a suitable filter to remove the noises present in a single image. (5 marks)</td><td>10</td><td>CO3</td><td>BL2</td></tr>
<tr><td>3.</td><td>A medical imaging system uses HSV color space to highlight regions of interest in MRI scans. A particular segmentation algorithm assigns the following HSV values to a detected tumor boundary Hue = 210°, Saturation = 75%, Value = 60%. The visualization module, however, requires colors in 7 bit RGB format for rendering on the display. Compute the RGB values used for visualization</td><td>10</td><td>CO3</td><td>BL3</td></tr>
</table>

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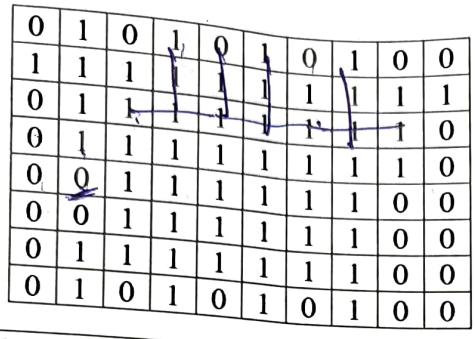
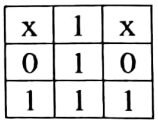
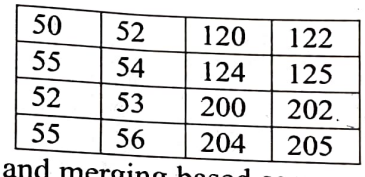
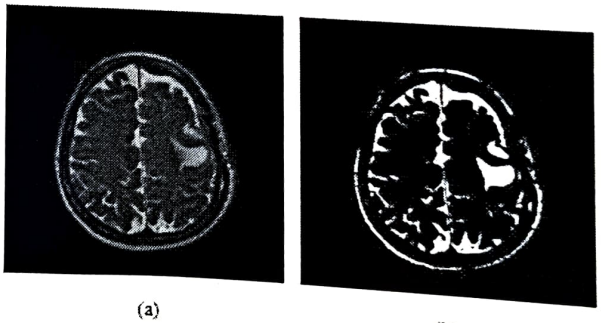
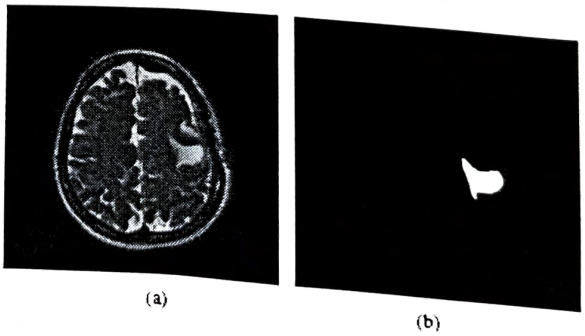
	module and Discuss why HSV is often preferred for segmentation and annotation, while RGB is used for final visualization.			
4.	Apply $S(A) = \bigcup_{k=0}^{K} S_k(A)$ on the given image A using the structuring element B. A =  B = 	10	CO4	BL3
5.	a) A 4×4 block of pixels has the following intensities as shown in the figure below, **(5 marks)**  Apply region splitting and merging based segmentation using the homogeneity criterion: Standard Deviation ≤ 5 and display the segmented regions. b) Analyse and discuss the segmentation techniques shown in Figure 1 and Figure 2. **(5 marks)** Figure 1  (a) (b) Figure 2  (a) (b)	10	CO4	BL4