DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Supplementary Summer Examination – 2024

Course: B. Tech. **Semester: V**

Branch : Electronics and Computer Engineering / Electronics and Computer Science Engineering

Subject Code & Name: Digital Signal & Image Processing **(**BTECPC502)

Max Marks: 60 **Date: 03/07/2024** **Duration: 3 Hr.**

Instructions to the Students:

1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*

		(Level/CO)	Marks
Q. 1	**Solve Any Two of the following.**		
A)	Describe the properties and provide the mathematical expressions for the following elementary signals: impulse, step, and ramp.	**CO1**	**6**
B)	Determine whether the system given by equation linear / non-linear and time variant / invariant i) $y(t) = ax(t) + b$ ii) $y(n) = nx(n)$	**CO1**	**6**
C)	Classify the signal $x(t)= \cos(2\pi t) + 3\sin(\pi t)$ as even, odd, periodic, non-periodic, deterministic, or non-deterministic, and justify your classification.	**CO1**	**6**
Q.2	**Solve Any Two of the following.**		
A)	Define Region of Convergence (ROC) in the Z-transform? Discuss its properties and explain how the ROC affects the stability and causality of the system.	**CO2**	**6**
B)	What is the Discrete Fourier Transform (DFT)? List and explain at least three properties of the DFT.	**CO2**	**6**
C)	Given two sequences $x[n]=\{1,2,3\}$ and $h[n]=\{4,5\}$ compute their linear convolution using the circular convolution method. Show all steps in your calculation.	**CO2**	**6**
Q. 3	**Solve Any Two of the following.**		
A)	Outline the fundamental steps involved in a digital image processing system. Briefly describe each step and its purpose within the system.	**CO3**	**6**
B)	What are the main components of an image processing system? Explain the role of each component and how they interact within the system.	**CO3**	**6**

C) Discuss some basic image operations, such as image addition, subtraction, and logical operations (AND, OR, NOT) with proper examples. **CO3** **6**

Q.4 Solve Any Two of the following.

A) Define image enhancement and explain its importance in digital image processing. Provide examples of applications where image enhancement is crucial? **CO4** **6**

B) What is the Discrete Cosine Transform (DCT) with its significance in image processing, particularly in image compression? **CO4** **6**

C) Write short note on types of smoothing filters and sharpening filters? **CO4** **6**

Q. 5 Solve Any Two of the following.

A) Write Short notes on Image Segmentation, Edge Detection, thresholding? **CO5** **6**

B) Given the image A and structuring element B **CO5** **6**

0	0	0	0	0	0
0	0	1	1	0	0
0	1	1	1	1	0
0	0	1	1	0	0
0	0	0	0	0	0

Image A

1
1
1

structuring element B

Compute A dilated by B

C) How can hit-or-miss transformation be used for extracting specific pixel configuration in an image? Give suitable example? **CO5** **6**

***** End *****