

QP Code : **8472**

(3 Hours)

[Total Marks : 100

- N. B. : (1) Question No. 1 is **compulsory**.
 (2) Solve any **four** questions from remaining six.
 (3) Assume suitable data if required.

1. Solve any **five** :- 20

- (a) Check unit step signal for energy/power signal and find its value.
 (b) Find DFT of $x(n) = \{3, 1, 2, 4\}$ using DIF-FFT.
 (c) Compare between lossy and lossless compression.
 (d) Explain image fidelity criterion.
 (e) Find Z.T. of $x(n) = \{2, -1, 0, 3, 4\}$. Find ROC of $x(z)$.
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 (f) Prove that 2D DFT matrix is an unitary matrix.

2. (a) Find the circular convolution of the two sequence 5

$$x_1(n) = \{1, -1, 2, -4\}$$

$$x_2(n) = \{1, 2\}$$

(b) Find the DFT of the given image 5

$$\begin{bmatrix} 0 & 1 & 2 & 1 \\ 1 & 2 & 3 & 2 \\ 2 & 3 & 4 & 3 \\ 1 & 2 & 3 & 2 \end{bmatrix}$$

(c) Find the inverse z-transform of 10

$$x(z) = \frac{z^3 - 4z^2 + 5z}{(z-1)(z-2)(z-3)}$$

For all possible ROCs.

3. (a) What are the different types of the redundancies in image. 5
 (b) Explain segmentation based on discontinuities. 5
 (c) Define signals and system and also give the classification of discrete time signals with suitable example. 10

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4. (a) Determine the system function and unit sample response of the given system described by the following difference equation. (Assume zero initial conditions.) 10

$$y(n) = \frac{1}{4}y(n-2) + \frac{1}{2}y(n-1) + x(n)$$

- (b) Check whether following sequence is periodic or not. If yes, find the fundamental time period. 5

$$x(n) = 3 \sin(0.01 \pi n) + 4 \cos(10n)$$

- (c) Find auto-correlation of 5
 $x(n) = \{1, 2, 3, 2\}$

5. (a) Perform histogram equalization on the given image transform. 10

Gray level	0	1	2	3	4	5	6	7
No. of pixel	70	100	40	80	60	40	08	02

- (b) Obtain the digital negative and thresholding of following 8 bits per pixel image. $T = 150$ 5

121	205	217	156	151
139	127	157	117	125
252	117	236	138	142
227	182	178	197	242
201	106	119	251	240

- (c) Justify why Laplacian is not good edge detector. 5

6. (a) Construct improved gray scale quantization code for the given level data set. 10

$$\{100, 110, 124, 124, 130, 200, 210\}$$

- (b) Explain image restoration and its application. 10

7. Write short notes on (any two) :- 20

- (a) K. L. Transform
 (b) Wavelet transform
 (c) Trimmed average filter
 (d) Edge linking and boundary detection via graph theoretic techniques.