

B.E. (Computer Engineering) Semester Seventh (C.B.S.)  
**Elective - II : Digital Signal & Image Processing**

P. Pages : 3

KNT/KW/16/7515

Time : Three Hours



Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
  2. Solve Question 1 OR Questions No. 2.
  3. Solve Question 3 OR Questions No. 4.
  4. Solve Question 5 OR Questions No. 6.
  5. Solve Question 7 OR Questions No. 8.
  6. Solve Question 9 OR Questions No. 10.
  7. Solve Question 11 OR Questions No. 12.
  8. Due credit will be given to neatness and adequate dimensions.
  9. Assume suitable data wherever necessary.
  10. Illustrate your answers wherever necessary with the help of neat sketches.
  11. Use of non programmable calculator is permitted.

1. a) What are advantages of Digital signal processing. 4
- b) An analog signal 5  
 $x(t) = \sin(500\pi t) + 5\cos(700\pi t)$   
 is sampled at 600Hz  
 i) Determine Nyquist rate  
 ii) Determine folding frequency  
 iii) What are the frequency in radians in the resulting discrete signal  $x(n)$ .
- c) Calculate: 5  
 i)  $y(n) = \frac{1}{3}\{x(n) + x(n-1) + x(n+1)\}$   
 ii)  $y(n) = \text{Max}^m\{x(n), x(n-1), x(n+1)\}$   
 If  $x(n) = \{3, 4, 5, 6\}$   
 $\quad \quad \quad \uparrow$
- OR**
2. a) What are the importance of Digital signal processing. 4
- b) Determine the system describe given below are static or dynamic, Linear or Nonlinear, 10  
 Time Variant or Invariant, causal or Non-causal.  
 i)  $y(n) = x(n) - x(n-1)$   
 ii)  $y(n) = n \cdot x(n)$   
 iii)  $y(n) = x(-n)$   
 iv)  $y(n) = x(n) \cdot \cos\omega n$
3. a) State and explain any three properties of Z-Transform. 6

- b) Determine convolution  $y(n)$  of the following sequence. 7

$$x_1(n) = \begin{cases} 5-n, & 0 \leq n \leq 4 \\ 0, & \text{otherwise} \end{cases}$$

$$x_2(n) = \begin{cases} (-1)^n, & 0 \leq n \leq 3 \\ 0, & \text{otherwise} \end{cases}$$

**OR**

4. a) Determine Z-Transform of following finite duration series. 6

i)  $x_1(n) = \{ \underset{\uparrow}{1}, 2, 3, 4 \}$

ii)  $x_2(n) = \{ -5, 4, \underset{\uparrow}{3}, 0, 2, 1, 7 \}$

iii)  $x_3(n) = \delta(n)$

- b) Determine the inverse Z-Transform of  $x(z) = \frac{1}{1 - 2z^{-1} + z^{-2}}$  7

where i) ROC  $|z| > 1$

ii) ROC  $|z| < 0.6$

5. a) State and explain any three properties of DFT. 6

- b) Obtain circular convolution of  $x(n)$  and  $h(n)$  using DFT-IDFT. 7

$$x(n) = \{ \underset{\uparrow}{2}, 4, 6, 8 \}$$

$$h(n) = \{ \underset{\uparrow}{1}, 2, 3, 4 \}$$

**OR**

6. a) Compute 8- point DFT of  $x(n)$  by radix-2 DIT-FFT Algorithm. 13

$$x(n) = \{ \underset{\uparrow}{1}, 2, 3, 4, 4, 3, 2, 1 \}$$

7. a) Discuss the fundamental steps in digital image processing with block diagram. 7

- b) Explain the components of image processing system with block diagram. 7

**OR**

8. a) Explain brightness adaptation and discrimination in the eye. 4

- b) Explain the sampling and quantization process used for creating digital image. 5

- c) Consider the image segment shown. 5  
 Let  $V = \{0,1\}$  and  $V = \{1,3\}$ . Compute the length of the shortest 4, 8 and m-path between p and q, if a particular path does not exist, explain the reason

				(q)
	3	1	2	1
	2	2	0	2
	1	2	1	1
(p)	1	1	1	2

9. a) Explain histogram equalization and its advantages. 5  
 b) Explain the following **any two**. 8  
 i) Image subtraction  
 ii) Image averaging.  
 iii) Sharpening spatial filters.

**OR**

10. a) Grey level histogram of an image is given below: 7

Gray level	0	1	2	3	4	5	6	7
Frequency	400	700	1350	2500	3000	1500	550	0

Compute the grey level histogram of the output image obtained by enhancing the input by histogram equalization techniques.

- b) Explain the concept of spatial filtering. 6  
 11. a) Write short note on colour image enhancement. 6  
 b) What is purpose of colour model in image enhancement. Discuss RGB color model. 7

**OR**

12. Write a short notes on: 3  
 i) CMY model of color image. 3  
 ii) YIQ color model. 4  
 iii) Intensity slicing. 3  
 iv) HIS color model. 3

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