

2037

B. Tech. (ECE)/M.B.A. Tech. (ECE)

EXAMINATION, Dec. 2023

(Seventh Semester)

DIGITAL IMAGE AND VIDEO PROCESSING

ECL-472-C

Time : 3 Hours

Maximum Marks : 80

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.

1. (i) What is Tapered Quantization ?
- (ii) List the hardware-oriented color models.
- (iii) Give the formulas for calculating D4 and D8 distance.
- (vi) Specify the properties of Fourier transform.
- (v) What are the basic steps in JPEG ?
- (vi) Write the applications of segmentation.
- (vii) What is Resolution ?
- (viii) Define Region Growing.

Unit I

2. With the help of a suitable diagram, briefly explain the different elements of visual perception.
3. What do you mean by histogram and histogram equalization ? With the help of suitable example, briefly explain that how histogram equalization is used for smoothing the image.

Unit II

4. What is Image Smoothing ? How is it achieved using frequency domain filters ? Describe the process using ideal Butterworth filters.
5. What is DFT ? Differentiate between 1-D and 2-D Discrete Fourier Transforms with suitable examples.

Unit III

6. Describe Wavelet transform and explain, how Fast Wavelet transform is different from normal Wavelet series expansion.
7. What is Segmentation ? How global and adaptive techniques are used for image segmentation and which technique gives better results in image segmentation and why ? Justify your answer.

Unit IV

8. Explain Compression. How can one achieve compression without loss of information in case of digital images ?
9. Write short notes on the following :
 - (i) JPEG-2000
 - (ii) DCT.

2028

B. Tech. (ECE)/M.B.A. Tech. (ECE)

EXAMINATION, Dec. 2023

(Fifth Semester)

MICROWAVE ENGINEERING

ECL-353

Time : 3 Hours

Maximum Marks : 80

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory. All questions carry equal marks.

1. (i) Discuss standard frequency bands.
- (ii) Discuss the role of cavity resonators.
- (iii) Discuss the use of strip lines.
- (iv) What is VSWR ?
- (v) Discuss the behaviour of circuits at conventional and microwave frequencies.
- (vi) Define TEM mode in rectangular waveguide.
- (vii) Discuss various microstrip circuits.
- (viii) Discuss the method used for measurement of unknown loads. **8×2=16**

Unit I

2. (a) Discuss the limitations of conventional tubes. 4
(b) Discuss about the construction, operation and characteristics of two-cavity klystron amplifier. 12
3. Discuss the construction, operation and performance characteristics of the following : 2×8=16
(a) TWT
(b) CF amplifier.

Unit II

4. (a) Derive an expression for propagation of TM wave in rectangular waveguide. 12
(b) Discuss the comparison of microwave components with transmission lines. 4
5. (a) Discuss various types of waveguide tees. Derive the scattering matrix for H-plane Tee. 8
(b) Write a note on circulator and isolators. 8

Unit III

6. Discuss the working principle and construction of varactor diode and tunnel diode along with applications. 16

7. Write notes on the following : 2×8=16
(a) TRAPATT diode
(b) Parametric amplifier.

Unit IV

8. (a) Give a brief description of Microwave bench-different blocks and their features. 10
(b) Discuss the methods used for measurement of reflection coefficient. 6
9. (a) Discuss various methods used for power measurement. 10
(b) Discuss the process of measurement of frequency and wavelength. 6

- (b) Find the Fourier transform of signal :

$$x(t) = e^{-at}u(t). \quad 6$$

- (c) Define mathematically Fourier transform and list its various properties. 6

Unit III

6. (a) Explain the significance and properties of Region of Convergence in Z Transform. 5

- (b) Determine the z-transform of the signal :

$$x(n) = a^n u(n). \quad 5$$

- (c) Determine the inverse of z-transform :

$$x(z) = \frac{z^{-1}}{(1-z^{-1})\left(1-\frac{1}{2}z^{-1}\right)} \quad \text{ROC : } |z| > 1. \quad 6$$

Or

Explain, how the analysis of discrete time invariant system can be obtained using convolution properties of Z-transform.

7. (a) Discuss the properties of Region of Convergence of Laplace Transform. Also explain the usage of Laplace Transform in analysis of system. 8
- (b) Define pole and zeros of system function. 4

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B. Tech. (ECE)/M.B.A. Tech. (ECE)

EXAMINATION, Dec. 2023

(Third Semester)

SIGNAL AND SYSTEMS

ECL-233

Time : 3 Hours

Maximum Marks : 80

Note : Attempt *Five* questions in all. Q. No. **1** is compulsory and contains eight subparts each of 2 marks. Attempt any other *four* questions, selecting *one* question from each Unit. All questions carry equal marks.

1. (i) Define step signal with its mathematical or graphical representation. 2
- (ii) Define the term causality as referred to continuous time system. Also conclude whether system described by the equation $y(t) = 3x(-t) - 7x(t-2)$ is casual or not. 2
- (iii) Distinguish between Finite Impulse Response and Infinite Impulse Response system. 2
- (iv) Write the trigonometric form of the Fourier series representation of periodic signal. 2

- (v) Define bilateral and unilateral Z-transform mathematically. **2**
- (vi) Define mathematically Laplace Transform. Also justify its significance in analysis of system. **2**
- (vii) Which among the following plays a crucial role in determining the state of dynamic system ? **2**
 - (a) State variables
 - (b) State vector
 - (c) State space
 - (d) State scalar.
- (viii) State space analysis is applicable even if the initial conditions are..... **2**
 - (a) Zero
 - (b) Non-zero
 - (c) Equal
 - (d) Not equal.

Unit I

- 2. (a) Describe the classification of continuous and discrete time signals with example. **8**
- (b) Draw the graphical representational signal : **4**
 - (i) $x(n) = u(n-3)$
 - (ii) $x(n) = \delta(n) + 2\delta(n-1) + 4\delta(n-2)$.

- (c) Define any *two* continuous time signal with mathematical or graphical representation : **4**
 - (i) Ramp signal
 - (ii) Pulse signal
 - (iii) Impulse signal.
- 3. (a) Discuss the properties of continuous or discrete time system with example. **10**
- (b) Explain the following transformation on signal with mathematical or graphical representation : **6**
 - (i) Time Reversal
 - (ii) Time Scaling
 - (iii) Time Shifting.

Unit II

- 4. (a) Explain the analysis of continuous or discrete time Linear Time Invariant system. **10**
- (b) What are different interconnections of LTI system ? Also determine the overall response of two cascaded and parallel Linear Time Invariant systems having impulse response $h_1(t)$ and $h_2(t)$. **6**
- 5. (a) Define the exponential form of the Fourier series representation of periodic signal. **4**

Or

Sketch the pole zero plot of a system having transfe

$$H(s) = \frac{s-2}{s^2+6s+8}$$

- (c) Find the Laplace transform of unit step signal
 $x(t) = u(t)$. **4**

Unit IV

8. (a) Describe the properties of state transition matrix. **8**
(b) Write the general form of state variable matrix. **8**
9. (a) Discuss the solution of state equation for discrete time LTI System. **8**
(b) Define any *two* of the following : **8**
(i) State variable
(ii) Eigen vectors
(iii) State of a system.

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