G 888 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Eighth Semester

Branch : Electronics and Communication Engineering/Applied Electronics and Instrumentation/Electronics and Instrumentation Engineering

DIGITAL IMAGE PROCESSING (Elective III) (LAS)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions briefly.*
Each question carries 4 marks.

1. Describe how a digital image can be obtained from an analog image ?
2. Explain the process of brightness adaptation and discrimination with suitable examples.
3. Define 2D-DFT. State and prove the shifting property of 2D-DFT.
4. Explain Hadamard transform and list its properties.
5. Explain how smoothing of spatial filters are done.
6. Explain the functioning of geometric mean filter, harmonic mean filter and contra-harmonic filter.
7. Explain the differences between image enhancement and restoration.
8. With a block diagram, explain an inverse filter used for image restoration.
9. What is predictive coding ? Explain with a neat block diagram.
10. List out any three principle types of data redundancies that can be identified in 2D intensity arrays.

(10 × 4 = 40 marks)

Part B

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. Explain the principle of image sampling and quantisation. Discuss the practical limitations in sampling and reconstruction of images.

Or

Turn over

12. (a) State and explain two-dimensional sampling theorem ? (6 marks)

(b) What is aliasing and its effects in images ? Discuss different methods of avoiding aliasing. (6 marks)

13. Perform KL transform for the following matrix $X = \begin{bmatrix} 4 & -2 \\ -1 & 3 \end{bmatrix}$

Or

14. Prove that an N × N Haar transform matrix is orthogonal and can be implemented in O(N) operations on an N × 1 vector.

15. Explain histogram, histogram equalization and the procedure to perform histogram equalization. Also perform historgram equalization on the image matrix shown below :

5	5	5	5	5
4	5	6	5	4
4	6	6	6	4
4	5	6	5	4
5	5	5	5	5

Or

16 Explain the basis of spatial filtering. Also using graphical method, determine the convolution of the following matrices :

$$x(m, n) = \begin{bmatrix} 0 & 1 & 2 \\ 2 & 4 & 3 \\ 0 & 1 & 0 \end{bmatrix}, \quad h(m, n) = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 2 \end{bmatrix}.$$

17. Explain in detail, the Wiener filter with suitable examples and also list out the drawbacks of it.

Or

18. Explain the following :–

(a) Image degradation model.

(b) Interactive restoration.

(c) Inverse and pseudo inverse filter.

19. (a) Explain run length coding (RLC). For P = 0.9 and m = 15, determine achieved average rate and coding efficiency using RLC. (8 marks)

(b) Explain the differences between zonal and threshold coding. (4 marks)

Or

20. (a) Discuss the transform coding technique used for image compression and decompression. (8 marks)

(b) Explain MPEG compression and its advantages. (4 marks)

[5 × 12 = 60 marks]