



**B.E DEGREE EXAMINATIONS: MAY 2017**

(Regulation 2014)

Sixth Semester

**ELECTRONICS AND COMMUNICATION ENGINEERING**

U14ECTE42: Digital Image Processing

**COURSE OUTCOMES**

- CO1:** Review the fundamental concepts of a digital image processing system  
**CO2:** Analyze images in the frequency domain using various transforms  
**CO3:** Evaluate the techniques for image enhancement and image restoration  
**CO4:** Categorize various compression techniques  
**CO5:** Interpret Image compression standards

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 1 = 10 Marks)**

1. Matching type item with multiple choice code

CO1 [K<sub>2</sub>]

List I	List II
A. Photopic	i. Fovea
B. Scotopic	ii. Absence of photoreceptors
C. Visual acuity	iii. Rods
D. Blind Spot	iv. Cones

- |    | A   | B  | C   | D  |
|----|-----|----|-----|----|
| a) | ii  | i  | iii | iv |
| b) | iii | iv | ii  | i  |
| c) | ii  | iv | iii | i  |
| d) | iii | i  | ii  | iv |

2. High Weber ratio implies\_\_\_\_\_.

CO1 [K<sub>2</sub>]

- |                                  |                                  |
|----------------------------------|----------------------------------|
| a) Good intensity discrimination | b) Poor intensity discrimination |
| c) uniform distribution of Rods  | d) Strong Illumination           |

3. Which of the following statements are true CO3 [K<sub>2</sub>]  
 S1. Average value of Laplacian operator is zero  
 S2. Prewitt operator is used to detect edges  
 S3. Image averaging is used to remove noise  
 a) S1 & S2 b) S2 & S3  
 c) S1 & S3 d) S1 & S2 & S3
4. The D4 distance between pixels at location (x,y) and (s,t) is \_\_\_\_\_ CO3 [K<sub>2</sub>]  
 a)  $|x - s| + |y - t|$  b)  $\max\{|x - s|, |y - t|\}$   
 c)  $\min\{|x - s|, |y - t|\}$  d)  $|x - s| - |y - t|$
5. Assertion (A): Cone vision has good spatial resolution CO1 [K<sub>2</sub>]  
 Reason (R): 5-8 million cones are present  
 a) Both A and R are Individually true and R is the correct explanation of A b) Both A and R are Individually true but R is not the correct explanation of A  
 c) A is true but R is false d) A is false but R is true
6. If the pixels in an image is shuffled, the histogram will \_\_\_\_\_ CO3 [K<sub>2</sub>]  
 a) Change randomly b) Not change  
 c) Move towards right d) Move towards left
7. Which of the following properties hold good for Discrete cosine transform CO2 [K<sub>2</sub>]  
 1. Data expansion 2. Separability 3. Energy compaction 4. Real and non-orthogonal  
 a) 1 & 2 b) 1 & 4  
 c) 2 & 3 d) 3 & 4
8. Sequence of steps followed in Canny Edge detection is CO3 [K<sub>1</sub>]  
 1. Smooth with 2D Gaussian  
 2. Find derivative  
 3. Find maxima  
 4. Threshold  
 a) 1 2 3 4 b) 1 4 3 2  
 c) 1 3 1 4 d) 1 3 2 1
9. In lossy compression, the total no. of bits in the image before compression is \_\_\_\_\_ CO4 [K<sub>1</sub>]  
 than that of the image after decompression.  
 a) lesser b) Not change  
 c) greater d) Same as

10. Predictive coding is based on eliminating the \_\_\_\_\_ CO5 [K<sub>1</sub>]
- a) Coding redundancies b) Spatial redundancies
- c) Coding and spatial redundancies d) Irrelevant information

**PART B (10 x 2 = 20 Marks)**

**(Answer not more than 40 words)**

11. The size of a color image is 1024 x 1024 and the pixel depth is 24bits. If this image is transmitted across a channel of 2 Mbps, what will be the transmission time? CO1 [K<sub>2</sub>]
12. What is false contouring? CO3 [K<sub>1</sub>]
13. Define 2 D DFT pair and list out its properties. CO2 [K<sub>1</sub>]
14. Differentiate between neighborhood processing and point processing CO3 [K<sub>2</sub>]
15. What is an isotropic mask? CO3 [K<sub>1</sub>]
16. What is a Shape number? CO3 [K<sub>1</sub>]
17. What is salt and Pepper noise? Write its PDF. CO3 [K<sub>1</sub>]
18. What is the disadvantage of inverse filtering for image restoration? CO3 [K<sub>2</sub>]
19. What is run length coding? Give an example. CO4 [K<sub>2</sub>]
20. Give the expression for computing two dimensional Fourier transform of an image. . CO2 [K<sub>1</sub>]

**Answer any FIVE Questions:-**

**PART C (5 x 14 = 70 Marks)**

**(Answer not more than 300 words)**

**Q.No. 21 is Compulsory**

21. i.) What is gradient operator? What are the different gradient operators used and explain (8) CO2 [K<sub>3</sub>]  
how it is used for detecting edges.
- ii.) Briefly Explain Image sampling and quantization. (6) CO1 [K<sub>3</sub>]
22. i.) What is intensity transformation? Briefly explain the different gray level intensity (8) CO1 [K<sub>3</sub>]  
transformation functions.
- ii.) Briefly explain the photoreceptors in the eye and their distribution (6) CO1 [K<sub>3</sub>]

23. i.) Compute 2D DCT of the 4X4 gray scale image given below (8) CO2 [K<sub>3</sub>]

1	1	1	1
1	1	1	1
1	1	1	1
1	1	1	1

ii.) Obtain the Hadamard kernel for N=8 recursively. (6) CO2 [K<sub>2</sub>]

24. i.) What are the different ways to estimate the degradation function? Explain them in detail. CO3 [K<sub>3</sub>]

ii.) What are the properties of first and second derivative of an image? CO3 [K<sub>3</sub>]

25. i.) The possible set of symbols and their probabilities are given below. Find the code word and the average length of the code using Huffman coding. (7) CO4 [K<sub>3</sub>]

Symbols	a1	a2	a3	a4	a5	a6
Probability	0.1	0.4	0.06	0.1	0.04	0.3

ii.) With key details explain the steps in image compression using JPEG standard. (7) CO5 [K<sub>3</sub>]

26. i.) What are the types of region based segmentation. Briefly explain each of them (7) CO3 [K<sub>3</sub>]

ii.) Briefly Explain the steps used in Canny Edge Detection algorithm? (7) CO3 [K<sub>3</sub>]

27. i.) What is the limitation of Fourier transform? How is it eliminated in wavelets? (7) CO2 [K<sub>3</sub>]  
Briefly explain wavelet transforms.

ii.) What is gradient operator? What are the different gradient operators used and (7) CO3 [K<sub>3</sub>]  
explain how it is used for detecting edges

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