KUMARAGURU
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B.E DEGREE EXAMINATIONS: NOV/DEC 2022

(Regulation 2018)

Seventh Semester

Electronics and Communication Engineering

U18ECE0011**:** Digital Image Processing

COURSE OUTCOMES

CO1:   **Explain the fundamental concepts of a digital image processing**
CO2:   **Compare various Image Transform Techniques**
CO3:   **Apply enhancement and restoration algorithms for image analysis**
CO4:   **Choose appropriate segmentation algorithms for given application**
CO5:   **Compare various Image compression techniques**

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	Compare photopic and scotopic vision	CO1	[K$_2$]
2.	Find the number of bits required to store a 256 X 256 image with 32 gray levels.	CO1	[K$_1$]
3.	List the applications of image transforms.	CO2	[K$_1$]
4.	Outline the separability property in 2D Fourier transform.	CO2	[K$_2$]
5.	Name the different types of derivative filters.	CO3	[K$_1$]
6.	Define histogram of an image.	CO3	[K$_1$]
7.	List the steps to perform the region based segmentation.	CO4	[K$_1$]
8.	What are skeleton representation of an image.	CO4	[K$_L$]
9.	What is the need for Compression?	CO5	[K$_1$]
10.	Recall transform coding.	CO5	[K$_1$]

Answer any FIVE Questions: -
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	a)	List out various spatial domain gray level transformation techniques and recall the functions of any four of them with appropriate examples.	8	CO1	[K$_1$]
	b)	Recall the concepts involved in defining the basic relationship between pixels.	8	CO1	[K$_1$]
12.	a)	Make use of the separability property to compute the two-dimensional DFT for	8	CO2	[K$_3$]

the given image.

$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

b)	Apply 2D DCT for the same image given in 12.a) and compute the results.	8	CO2	[K3]

13. a) Extend the First order and second order derivative filters for image sharpening. 8 CO3 [K2]

    b) What are the limitations of inverse filter in image restoration? Explain how Wiener filter overcome these limitations with appropriate mathematical expressions. 8 CO3 [K2]

14. a) Discover the minimum cost path using Edge linking Graph theoretic technique top to bottom of the image given below. Assume the edge starts from first column and ends at the last column. 8 CO4 [K4]

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7   2   2
5   7   2
5   1   0
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    b) Recall the concepts of the following boundary descriptors. 8 CO4 [K1]
       1.Shape numbers   2. Fourier descriptors

15. a) The frequency of the characters used in a data file is given below. Apply Huffman Code to generate a new data file representing the same file but need less memory space for storage. 8 CO5 [K3]

Character	a2	a6	a1	a4	a3	a5
Frequency	0.4	0.3	0.1	0.1	0.06	0.04

    b) Extend the concept of Discrete Cosine Transform to JPEG image compression standard. 8 CO5 [K2]

16. a) How is an analog image is converted into digital image? Illustrate the effect of brightness adaptation and brightness discrimination in visual perception. 8 CO1 [K2]

    b) Identify an image enhancement technique which converts an image with uniform distribution of pixel values. Experiment with the same on the below image. 8 CO3 [K3]

2	3	3	2
4	2	4	3
3	2	3	5
2	4	2	4

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