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Roll No.....

FIFTH SEMESTER

B.Tech.

SUPPLEMENTARY EXAMINATION **Feb.-2019**

DIGITAL IMAGE PROCESSING (EC357)

Time: 3:00 Hours *Max. Marks: 50*

Note: Answer all questions. All questions carry equal marks. Assume suitable missing data.

Q.1 Answer all the questions.

[a] Define three types of adjacencies. [1.5]

[b] Write down the expression for power law transformation and show the plot for different values of gamma. [2]

[c] Differentiate enhancement and restoration. [1.5]

[d] Define dilation and erosion. [1.5]

[e] Discuss different image file formats. [2]

[f] How do we achieve centre shifting in 2-D DFT? [1.5]

Q.2 Attempt any TWO of the following

[a] State and explain the examples of fields, based on radiation from EM spectrum, that use Digital Image Processing. [5]

[b] Consider the intensity values of an $(M \times N)$ digital image as the random quantities. Write down the expressions for mean (average), variance, and nth moment of intensities. Also explain the significance of mean and variance of the image in respect of its visual properties. [5]

[c] Develop a procedure to calculate the Discrete Cosine Transform of an (8×8) image. Assume suitable intensity values. [5]

P.T.O.

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Q.3 Attempt any TWO of the following

[a] Classify 2D systems. Also, with the help of suitable example, explain the concept of 2D Convolution. [5]

[b] Consider (64×64) hypothetical image whose histogram values are as shown below (column three of the table). It is desired to transform this histogram so that it will have values specified in the second column of the table. Develop a procedure to obtain the specified histogram. [5]

z_q	Specified $p_z(z_q)$	Actual $p_r(r_k)$
$z_0 = 0$	0.00	0.00
$z_1 = 1$	0.00	0.00
$z_2 = 2$	0.00	0.00
$z_3 = 3$	0.15	0.19
$z_4 = 4$	0.20	0.25
$z_5 = 5$	0.30	0.21
$z_6 = 6$	0.20	0.24
$z_7 = 7$	0.15	0.11

[c] Prove that $\nabla^2 f(t,z) \Leftrightarrow -4\pi^2(\mu^2 + v^2)F(\mu,v)$ where ∇^2 is the Laplacian of a continuous function $f(t,z)$ and $F(\mu,v)$ represents Fourier Transform. [5]

Q.4 Attempt any TWO of the following

[a] What are the most common PDFs found in image processing applications. Write down the expressions for these and show the plots of the density functions. [5]

[b] Why are the adaptive filters called so? Develop the adaptive median-filtering algorithm and explain its working. [5]

[c] Discuss the following with respect to morphological image processing: [5]

(i) Region Filling

(ii) Pruning

P.T.O.

Q.5 Attempt any TWO of the following

[a] Write short notes on the following Color Models [5]

(i) HSI Model

(ii) YCbCr Model

[b] Consider the simple 4×8, 8-bit image: [5]

21	21	21	95	169	243	243	243
21	21	21	95	169	243	243	243
21	21	21	95	169	243	243	243
21	21	21	95	169	243	243	243

(i) Compute the entropy of the image

(ii) Compress the image using Huffman coding

(iii) Compute the compression achieved and the effectiveness of the Huffman coding with respect to maximum compression possible.

[c] Explain how is Laplacian of a Gaussian (LoG) operator helpful in detecting the edges of an image. Also show the (5×5) mask that approximates the shape of LoG. [5]

END