Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII • EXAMINATION – SUMMER • 2015

Subject code: 181102 **Date:05/05/2015**

Subject Name: Fundamentals of Image Processing

Time: 10.30AM-01.00PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** i. Contrast between dynamic range and contrast. **02**

ii. Differentiate between spatial resolution and intensity resolution. **02**

iii. Explain in brief the sampling checkerboards and the false contouring effects. **03**

(b) i. Compare various methods of image interpolation. **03**

ii. Differentiate between image enhancement and image restoration. **02**

iii. Make comparison between point processing and neighborhood processing techniques. **02**

Q.2 **(a)** Given histograms (a) and (b), modify the histogram of image (a) as per the histogram of image (b). **07**

Histogram (a)

Gray level	0	1	2	3	4	5	6	7
No. of Pixels	790	1023	850	656	329	245	122	81

Histogram (b)

Gray level	0	1	2	3	4	5	6	7
No. of Pixels	0	0	0	614	819	1230	819	614

(b) Consider that the digital image is corrupted by following noises individually: 1. Salt & pepper noise, 2. Salt noise only, 3. Pepper noise only. Suggest & explain the best suitable spatial filtering methods to remove the noise from the image in each case. **07**

OR

(b) i. What is gamma correction? What is its importance? **02**

ii. What is mean and standard deviation of the histogram? What are the physical significances of these quantities? **03**

iii. There are two images I1 and I2. They have identical histograms. Suppose we form a third image I3 as I3=I1 - I2. Will this image I3 be a zero image? Give reason for your answer. **02**

Q.3 **(a)** Write a detailed note on image pyramids and sub-band coding. **07**

(b) Discuss frequency domain formulations of the Laplacian, Unsharp masking, Highboost filtering, and High-frequency-emphasis filtering with applications. **07**

OR

Q.3 **(a)** Write a detailed note on 2-D fast wavelet transform. **07**

(b) i. Explain the ringing property of ILPFs using the convolution theorem. **03**

ii. Discuss CMY color model. Why CMYK color model is **04**

required?

Q.4 **(a)** i. Differentiate between radiance and luminance using one example. **02**

ii. Write a short note on all-system-safe colors. **05**

(b) With the following symbols and their probabilities of occurrence, encode the message "ACBA" using the arithmetic coding algorithm. **07**

Symbol	A	B	C
Probability	0.8	0.02	0.18

OR

Q.4 **(a)** i. Differentiate between noise and degradation. **01**

ii. Draw and explain in brief the model of the degradation/restoration process. **04**

iii. Discuss in brief spatial and frequency properties of the noise. **02**

Q.4 **(b)** List and exemplify different types of redundancy available in the digital image. **07**

Q.5 **(a)** Explain the concept of Laplacian and LoG for edge detection and comment on the comparison of both the operators. **07**

(b) i. Prove that dilation and erosion are duals of each other with respect to set complementation and reflection. **03**

ii. Write a brief note on inverse filtering. Also discuss the problem with the same. **04**

OR

Q.5 **(a)** i. What is the advantage of using Sobel operator? **01**

ii. Explain the process of edge detection using gradient operators. **06**

(b) List out various basic morphological algorithms and explain any one in detail. **07**

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