IT 472 – Digital Image Processing

Dhirubhai Ambani Institute of Information and Communication Technology (DA-IICT)
End-Sem Examination, April 2019

[Time – 3 Hour]
[Total Marks - 60]

Instructions:

- **Calculators are allowed in examination.**
- **All questions are self-explanatory and understanding of question is a part of evaluation. No query regarding questions will entertained during examination by course instructor or invigilator.**

Section A

Multiple choice question (Write the most appropriate answer in answer sheet)
[5 x 1 = 5 Marks]

1. With reference to sensing, two elements used to acquire digital images are a physical device and _____.
   a) Digitalizer b) Hardware Bus
   c) Regional Representation d) ALU

2. Which of the following is used for recording images for hardcopy devices?
   a) Optical fibre b) Touch screen
   c) Heat-sensitive devices d) Transparent film

3. The types of images are generated by the combination of an "illumination" source and _____ of energy from that source by the elements of the "scene" being imaged
   a) Refraction b) Reflection
   c) Luminance d) Transmittance

4. One-dimensional imaging sensor strips that respond to various bands of the electromagnetic spectrum are mounted _____ to the direction of light
   a) At 4000 x 4000 elements
   b) Ring configuration
   c) At 180 degrees
   d) At 90 degrees

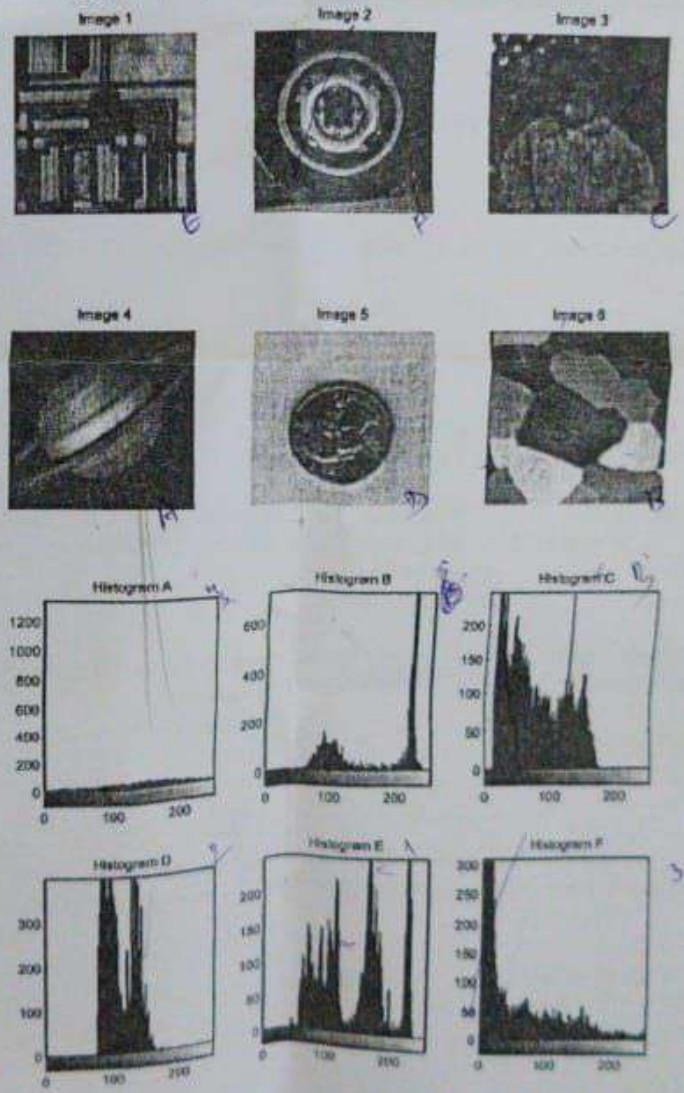
5. _____ experiments indicate that a photograph or visual signal with accentuated or crispened edges is often more subjectively pleasing than an exact photometric reproduction.
   a) False color
   b) Enhancement procedures
   c) Histogram modification
   d) Psychophysical

Section B
[3 x 5 = 15 Marks]

6. What is Laplacian of an image? Derive an appropriate mask for the Laplacian operator. Explain how Laplacian can be used for detecting edges in an image.

7. Explain the image acquisition using single sensor and circular sensor strips.

8. Figure below includes six different images from Image 1 to Image 6 and their pixel histograms underneath labeled Histogram A to Histogram F in disorder. Match the images (1-6) with their corresponding pixel histograms (A-F).



Section C
[4 x 10 = 40 Marks]

9. Perform Filter operation on the image shown in below figure by using a 3 x 3 median filter mask and hence prove that median filtering minimizes salt and pepper noise.

64	23	33	35	32	24
34	255	24	0	26	23
23	21	32	31	28	26
15	20	100	90	43	12

10. Consider the image segment shown below and set V={0,1}. Compute the lengths of shortest 4, 8, and m-path between p and q. if path does not exist between p and q, explain why?

	0	1	0	4	2 (q)
	3	4	1	2	0
	2	2	3	1	4
	3	0	4	2	1
(p)	1	2	0	3	4

11. Compute 2D-DFT of a 7 x 7 gray scale image shown below, and corresponding inverse DFT

1	1	0	0	1	1	0
1	2	3	3	2	1	0
4	5	3	3	5	4	2
1	2	7	7	2	1	3
1	2	6	6	2	1	0
4	5	3	3	5	4	2
1	2	3	3	2	1	6

12. Consider the following image **A**, and let the structuring element be **B**. perform the morphological operations (i). Erosion, (ii). Dilation, (iii). Opening, and (iv). Closing.

A	64	23	33	35	32	24
	34	255	24	0	26	23
	23	21	32	31	28	26
	15	20	100	90	43	12
	24	88	70	23	50	66
	88	45	29	51	67	39

B	1	1	1
	1	1	1
	1	1	1