

ET802M - Digital Image & Video Processing

P. Pages : 3

GUG/W/24/14355

Time : Three Hours



Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Assume suitable data wherever necessary.
 3. Illustrate your answers wherever necessary with the help of neat sketches.

1. A Explain the fundamental steps in digital image processing which can be applied to images. **8**
 b) Describe JPEG file format. What are the important features of JPEG file format ? Also mention advantages and disadvantages of JPEG file format. **8**

OR

2. a) Let $V = \{0, 1\}$. Compute the D_e , D_4 , D_8 and D_m distances between two pixels p and q. **8**
 Let the pixel coordinates of p and q be (3, 0) and (2, 3) respectively, for the image shown in fig.

	0	1	2	3
0	0	1	1	1
1	1	0	0	1
2	1	1	1	1
3	1	1	1	1

(p)

(q)

- b) What is meant by resolution? Distinguish between spatial and gray level resolution. **4**
 c) Mention the situation in which the usage of GIF file format will be appropriate. **4**
3. a) The input matrix $x(m, n)$ and $h(m, n)$. Perform the linear convolution between these two matrices. **8**

$$x(m, n) = \begin{bmatrix} 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix} \quad h(m, n) = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}.$$

- b) Construct Walsh basis for $N=4$. **8**

OR

4. a) Compute the inverse 2D DFT of the transform coefficients given by 4

$$F[k,l] = \begin{bmatrix} 16 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

- b) Explain about image smoothing using Ideal low pass filter. 6
- c) Define log transformation and write its application. 6

5. a) Explain about CMY color model. 8

- b) Let the RGB values of a point be (0.4, 0.6, 0.8). Find the HSV equivalent of RGB. Also verify whether the original point can be obtained by the inverse transform from HSV to RGB. 8

OR

6. a) What is a chromaticity diagram? Explain CIE chromaticity diagram. 8

- b) Determine the CIE chromaticity coordinates of a point given 8
 $C_1 = (0.14, 0.4, 2)$ and $C_2 = (0.51, 0.6, 1)$ Find the third colour C_3 .

7. a) Consider a one-dimensional image $f(x) = 60 \ 60 \ 60 \ 100 \ 100 \ 100$. What are first and second derivatives? 4

- b) Define image segmentation. Give classification. Explain region based segmentation. 8

- c) List various first derivative operators. 4

OR

8. a) An image scan centre needs to store medical images whose resolution is 1024 x 1024 x 24 bits. A total of 10,000 images are present. How much storage (in KB) and transmission time (in hours) will they require at 64 kbps? 6

- b) Construct the Huffman code for the set of symbols shown in table below. 6

Symbol	A	B	C	D
Probability	0.4	0.3	0.2	0.1

- c) Define the following metrics which are used to quantify compression measures 4
 i) Compression ratio ii) Saving percentage.

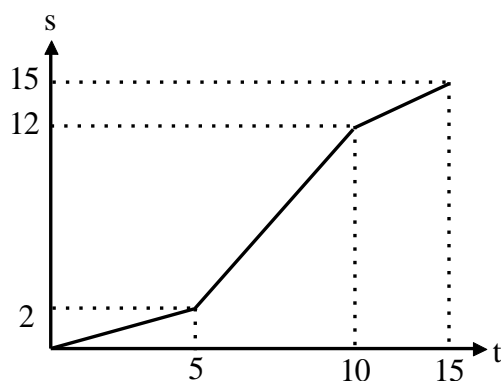
9. a) Write video frame classification and various digital video formats. 8

b) For the digital image shown in fig, perform following operations

8

$$\begin{bmatrix} 10 & 2 & 13 & 7 \\ 11 & 14 & 6 & 9 \\ 4 & 7 & 3 & 2 \\ 0 & 5 & 10 & 7 \end{bmatrix}$$

I) Contrast stretching as per the characteristics given below



II) Draw the histogram of original and new image.

III) Equalize the histogram.

OR

10. a) Write applications and advantages of Motion Vector.

8

b) Explain deferment types of frames in video signals.

8
