Code No: M0424/R07 **Set No. 1**

IV B.Tech I Semester Regular Examinations, November 2012
DIGITAL IMAGE PROCESSING
(Electronics & Communication Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. A common measure of transmission for digital data is the baud rate, defined as the number of bits transmitted per second. Generally, transmission is accomplished in packets consisting of starting bit, a byte of information, and a stop bit. Using this approach, answer the following.
   (a) How many minutes would it take to transmit a 512×512 image with 128 grey levels at 300 baud?
   (b) What would the time be at 9600 baud?
   (c) Repeat (a) and (b) for a 1024×1024 image 128 grey levels. [16]
2. (a) What is FFT? What is its usefulness?
   (b) Compare the computations of DFT with and without FFT. [8+8]
3. Suppose that a digital Image is subjected to histogram equalization. Show that a second pass of histogram equalization will produce exactly the same result as the first pass. [16]
4. Sketch perspective plot of an 2-D Ideal Low pass filter transfer function and filter cross section and explain its usefulness in Image enhancement. [16]
5. Draw and Explain the schematic diagram how pixels of an RBG color image are formed from the corresponding pixels of the three components images. [16]
6. Explain the following Order-Statistics Filters.
   (a) Max and min filters
   (b) Median filter
   (c) Alpha-trimmed mean filter. [16]
7. A binary image contains straight lines oriented horizontally, vertically, at 45^0 and at -45^0 give a set of 3×3 mask that can be used to detect 1-pixel-long brakes in these lines.assume that the gray levels of lines is one and that the gray level of the background is 0. [16]
8. Explain about video compression standards. [16]

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Code No: M0424/R07 **Set No. 2**

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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Show that the D4 distance between two points p and q is equal to the shortest 4-path between these points. Is this path unique? [16]
2. (a) Find Fourier transform 2 -D sinusoidal function n(x,y) = A $\sin(u_0x + v_0y)$
   (b) Obtain the spectrum in above case. [10+6]
3. What is histogram of an Image? Sketch histograms of basic Image types. Discuss how histogram is useful for Image enhancement. [16]
4. Sketch perspective plot of an 2-D Ideal Low pass filter transfer function and filter cross section and explain its usefulness in Image enhancement. [16]
5. Derive the CMY intensity mapping function of si = kri + (1-k) where i=1,2,3 from its RGB counterpart in si = kri where i =1,2,3. [16]
6. Explain about the following Mean Filters.
   (a) Arithmetic mean filter
   (b) Geometric mean filter
   (c) Harmonic mean filter. [16]
7. Explain about the Hough Transform Line Detection and Linking. [16]
8. (a) Draw and explain a general compression system model.
   (b) Draw the relevant diagram for source encoder and source decoder. [8+8]

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Code No: M0424/R07 **Set No. 3**

IV B.Tech I Semester Regular Examinations, November 2012
DIGITAL IMAGE PROCESSING
(Electronics & Communication Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Discuss basic transformations of pixels.
   (b) Define concatenation. [12+4]
2. Give the expressions for 1D and 2D kernels of Walsh transform, also give the transform expressions. [16]
3. (a) Develop a procedure for computing the median of an nxn neighborhood.
   (b) Propose a technique for updating the median as the center of the neighborhood is moved from pixel to pixel. [16]
4. Suppose that you form a Low pass spatial filter that averages the 4- neighbors of point (x,y), but excludes the point (x,y) itself
   (a) Find the equivalent filter H(u,v) in the frequency domain
   (b) Show that your result a low pass filter. [16]
5. Explain about following color transformation techniques
   (a) RBG to HIS
   (b) HIS to RBG. [8+8]
6. What is Noise? what are the spatial and frequency properties of noise? [16]
7. Consider a binary image of size N × N pixels that consists a square of 1's of size n × n pixels at its center. The rest of the pixels in this image are pixels in the gradient image.
   (a) Sketch the histogram of edge detections computed from given in the equation of $\alpha(x, y) = \tan^{-1}(Gx/Gy)$. Be precise in the labeling the height of each peak of the histogram.
   (b) Sketch the Laplacian of the image for the approximations of given in the equation of $\nabla^2 f = 4z_5 - (z_2 + z_4 + z_6 + z_8)$. Give the values of all the pixels in the Laplacian image. [8+8]
8. A binary erasure channel is one in which there is a finite probability β that a transmitted symbol will not be received. The channel has three possible outputs: a0, an erasure (no received symbol), and a1. These three outcomes form the three rows of the binary erasure channel matrix.

$$Q = \begin{bmatrix} 1-\beta & 0 \\ \beta & \beta \\ 0 & 1-\beta \end{bmatrix}$$

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(a) Find the capacity of the channel.

(b) Would you prefer a binary symmetric channel with a 0.125 probability of error or an erasure channel with probability of erasure $\beta = 0.5$? [16]

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Code No: M0424/R07 **Set No. 4**

IV B.Tech I Semester Regular Examinations, November 2012
DIGITAL IMAGE PROCESSING
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. With neat block diagram explain the digital image processing system. [16]
2. With reference to FFT show that
   (a) W2ux2M=WuxM
   (b) Wu+MM=WuM
   (c) Wu+M2M=-Wu2M. [16]
3. Discuss Image smoothing with the following
   (a) Low pass spatial filtering
   (b) Median filtering. [16]
4. Discuss the frequency domain techniques of Image enhancement in detail. [16]
5. Show that the saturation component of the complement of a color image cannot be computed from the saturation component of the input image alone. [16]
6. Explain the following:
   (a) Circulent matrices
   (b) Block-Circulent matrices. [8+8]
7. Propose a technique for detecting gaps of length ranging between 1 and L pixels in line segments of gradient image. Assume that the background is constant, that all lines have been coded with the same intensity level, and that the lines are 1 pixel thick. Base your technique on 8- neighbor connectivity analysis. [16]
8. Calculate the various probabilities associated with the information channel in which A={0,1}, B={0,1}, z=[0.75,0.25]^T

$$Q = \begin{bmatrix} \frac{2}{3} & \frac{3}{3} \\ \frac{1}{10} & \frac{9}{10} \end{bmatrix}$$

Include P(a=o), P(a=1), P(b=0), P(b=1),P(b = 0|a = 0), P(b = 0|a = 1), P(b = 1|a = 0), P(b = 1|a = 1), P(a = 0|b = 0), P(a = 0|b = 1), P(a = 1|b = 0), P(a = 1|b = 0), P(a = 0, b = 0), P(a=0,b=1), P(a=1,b=0), and P(a=1,b=1). [16]

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