

GANPAT UNIVERSITY
B. Tech. Sem. VII (EC)
Regular Examination Nov/Dec 2013
2EC706: Digital Image Processing

Max. Time: 3 Hrs.]

[Max. Marks: 70

Instructions:

1. Attempt all questions.
2. Answers to the two sections must be written in separate answer books.
3. Figures to the right indicate full marks.
4. Assume suitable data, if necessary.

SECTION-I

- Q-1** (A) Explain with the help of experimental arrangement the image acquisition using the circular sensor. (4)
- (B) Explain with the help of block diagram the Components of a general-purpose image processing system. (4)
- (C) What is the common problem we face while transferring from spatial domain to frequency domain? How do we solve this problem? (4)

OR

- Q-1** (A) Explain sampling theorem with the help of an example and also explain what would happen if it is not satisfied. (4)
- (B) Write a short note on properties of the 2D DFT. (4)
- (C) List out the steps for filtering in the frequency domain. (4)
- Q-2** (A) Consider the following image A of size 4 x 4. Filter the image A using Robert cross-gradient operator and Sobel operator. (6)

15	12	8	16
12	8	10	9
16	12	10	14
9	11	8	16

- (B) (1) What effect would setting to zero the lower-order bit planes have on the histogram of an image in general? (6)
- (2) What would be the effect on the histogram if we set to zero the higher order bit planes instead?

OR

- Q-2** (A) What is Homomorphic filtering? Why it is used? Explain it with the help of block diagram. (6)
- (B) Show that Laplacian operator is invariant to rotation. (6)
- Q-3** Do as directed. (Each of 1 mark) (11)
- (1) What is the different between digital image processing and digital image analysis.
 - (2) What do we gain or lose when we digitize a text document as binary image instead of gray level image?
 - (3) What we gain or lose if we pack 8 binary pixels in one byte?
 - (4) Why should the image transforms have an inverse transform?
 - (5) If we want to correlate two images of size 300*200 pixels, how much should they be padded with zeros?

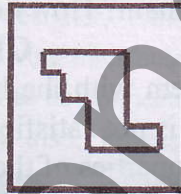
- (6) How much RAM we need for the 2D DFT calculation of a 4096*4096 image?
- (7) Why do we prefer DCT instead of DFT for compression?
- (8) Why do moving average filters destroy image edges?
- (9) Why do median filters destroy image details?
- (10) What is the disadvantage of histogram equalization?
- (11) Why do doctors use pseudo colored medical images?

SECTION-II

- Q-4** (A) Define redundancy with respect to image, classify redundancy and explain them in detail. (6)
- (B) Obtain the Ternary Huffman code for the word 'ENGINEERING'. Also determine the average length, entropy and efficiency. (6)

OR

- Q-4** (A) Explain the block diagram of DPCM with quantiser. (6)
- (B) Draw and explain the block diagram of baseline JPEG encoder and decoder. (6)
- Q-5** (A) Segment the given arbitrary shape shown below by the quadtree approach. (6)



- (B) Draw and explain the block diagram of 3 stage Wavelet de-composition. What are the advantages of Wavelet transform over other transforms. (6)

OR

- Q-5** (A) Draw and explain the block diagram of 3 stage Wavelet re-composition. What are the advantages of Wavelet transform over other transforms. (6)
- (B) What is Bit plan slicing? Explain the same using an appropriate example of 5x5, 4 bit image. What is the use of bit plane slicing? (6)
- Q-6** Following is the image A of size 8 x 8 : (11)

- (i) Calculate & Plot the histogram of image A.
- (ii) Calculate the mean and standard deviation of the histogram.
- (iii) Stretch the image so that the mean and standard deviation of the new image are 20 and 2 respectively.
- (iv) Using the template $T = 1/9 [0 \ 1 \ 0 ; 1 \ 5 \ 1 ; 0 \ 1 \ 0]$, calculate the filtered image of A.

15	12	8	16	12	9	14	11
12	8	10	9	8	11	9	14
16	12	10	14	9	11	10	8
9	11	8	16	12	14	8	10
12	16	9	10	11	9	9	9
8	11	16	12	16	9	12	10
9	12	11	16	11	12	13	8
14	8	12	11	10	16	9	14

END OF PAPER