Exam Slot → **E**

APJ Abdul Kalam Technological University
First Semester M.Tech Degree Examination December 2016
Ernakulam II Cluster
COMPUTER SCIENCE AND ENGINEERING
Specialization: COMPUTER SCIENCE AND ENGINEERING

05 CS 6013–DIGITAL IMAGE PROCESSING (ELECTIVE 1)

Time : 3 hrs. Max. Marks:60

I.

a) Suppose that a digital image is subjected to histogram equalization. Show that second pass of histogram equalization on the histogram equalized image will produce exactly the same result as the first pass (6 marks)

b) Draw the graph for Power-Law (Gamma) transform for various values of gamma. (3 mark)

c) Discuss in brief about Image interpolation. (3 marks)

II

a) Prove the validity of the below equation where FT stands for Fourier Transform
$FT[f(x,y)(-1)^{x+y}] = F(u-\frac{M}{2}, v-\frac{N}{2})$ (5 marks)

b) A 5 x 5 image patch is shown below. Compute the value of the marked pixel if it is smoothened by a 3 x 3 average filter. (4 marks)

$$\begin{bmatrix} 0 & 1 & 2 & 3 & 2 \\ 5 & 6 & 7 & 8 & 4 \\ 4 & 3 & \boxed{2} & 1 & 2 \\ 8 & 7 & 6 & 5 & 3 \\ 1 & 5 & 3 & 7 & 8 \end{bmatrix}$$

c) Write the equation for Butterworth Low pass filter and Gaussian Low pass filter. (3 marks)

III

a) Show that the scaling function

$$\emptyset(x) = \begin{cases} 1 & 0.25 \le x < 0.75 \\ 0 & elsewhere \end{cases}$$

does not satisfy the second requirement of a multi resolution analysis (9 marks)

b) Discuss the steps in arithmetic coding with an example (9 marks)

OR

IV

a) Compute the expansion coefficient of 2-tuple $[3,2]^T$ for the following bases and write the corresponding expansions:
Basis $\emptyset_0 = [1/\sqrt{2},\ \ 1/\sqrt{2}]^T$ and $\emptyset_1 = [1/\sqrt{2},\ \ -1/\sqrt{2}]^T$ on R^2 , the set of real 2-tuples (6 marks)

b) Discuss in brief with equations about discrete wavelet transform(DWT) and scaling function (8 marks)

c) Write the steps of Run length coding in brief. (4 marks)

V

a) Write the algorithm for optimum global thresholding using Otsu's method (7 marks)
b) Discuss about the Line detection methodology. (7 marks)
c) Discuss in brief how statistical moments are used as boundary descriptors. (4 marks)

OR

VI

a) Write in short about any two regional descriptors. (6 marks)
b) Discuss about Prewitt operator, Sobel and Roberts operator. (6 marks)
c) Discuss the technique for point detection in an image. (6 marks)