53 (EC 714) DIPR

2017

DIGITAL IMAGE PROCESSING

Paper : EC-714

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* What do you mean by an analogand a digital image ? Why do we need a digitalization of an image ? 6

   (b) Explain 2D sampling theory and describe the following points with neat graphical representation

   (i) Band limited image in frequency domain

   (ii) Nyquist criteria

   (iii) Reconstruction filter

(iv) Aliasing effect.

Provide necessary mathematical interpretation for the explanation. 14

2. (a) What do you mean by histogram equalization ? How does it improve the quality of an image ? 5

(b) Perform histogram equalization for an image which has the following intensity distribution function. Find the new values of intensity levels after equalization and find the histogram after equalization. 9

r_n	n_k	$P_r(r_k)=n_k/MN$
$r_0=0$	790	·19
$r_1=1$	81	·02
$r_2=2$	122	·03
$r_3=3$	1023	·25
$r_4=4$	245	·06
$r_5=5$	850	·21
$r_6=6$	656	·16
$r_7=7$	329	·08

(c) Define and state the difference between degration and restoration function of an image accuisition system. 6

3. (a) State the kernal based 2D image transformation. Find the order of complexity of an NXN image for performing image transformation. 5

(b) What is separability properly of a kernal function ? State how it reduces the computational complexity. 5

(c) Write the forward and inverse transformation equations of *(i)* 2DFT, *(ii)* 2DCT and *(iii)* 2DHT 10

4. (a) State the advantages of Winner filter. Explain how to decide the transfer function mathematically. 3+8

(b) What is the speciality of homomorphic filtering ? Explain the working at homomorphic filting with necessary mathematical derivation. 9

5. (a) Define convolution in 1D and 2D space An image of size ($M1 \times N1$) is convolved with another image of size ($M2 \times N2$). What would be the size of the resultant image ? 5

(b) Perform convolution of $X1$ with $X2$ with graphical way

$X1 = 1\ 2\ 3\ 4$
$\uparrow$
$X2 = 4\ 5\ 3\ 2$
$\uparrow$

6

(c) Perform FFT of the following sequence 9

$X = [1\ 5\ 3\ 7\ 2\ 4\ 6\ 8]$

6. (a) What are the advantages of image compression ? 4

(b) Define redundancy. Give examples of one lossless and one lossy image compression technique. 4

(c) Describe with detail block diagram the steps of JPEG image compression. 12

7. Write short notes : ***(any two)*** 10+10

(a) FFT

(b) Histogram Specification

(c) K-L transform

(d) Run length coding.
