GANPAT UNIVERSITY

B. Tech. Semester: VII (Mechatronics) Engineering
Regular Examination Nov-Dec 2013
Digital Image Processing and Machine Vision (2MC705)

Time: 3 Hours

Total Marks: 70

Instruction: 1 Start a new question from new page.
2 Draw the figure with full indication.
3 Answer to the two sections must be written in separate answer sheet.

Section - I

Que. – 1 [12]

(a) What is intensity slicing? Give two approach of intensity slicing. Apply both for following (05)
Image.

$$I = \begin{bmatrix} 1 & 3 & 5 & 2 \\ 3 & 9 & 10 & 11 \\ 5 & 15 & 4 & 12 \\ 9 & 8 & 7 & 10 \end{bmatrix}$$

(b) An image has the intensity PDF $P_r(r) = \begin{cases} \frac{3r^2}{(L-1)^3}; & 0 \le r \le (L-1) \\ 0 & ; \quad for\ others \end{cases}$ Find transformation (04)

function that will produce an image whose intensity PDF is $P_z(z) = \begin{cases} \frac{4z^3}{(L-1)^4}; & 0 \le z \le (L-1) \\ 0 & ; \quad for\ others \end{cases}$

(c) Find the convolution for given 1D image $f = [0\ 0\ 0\ 1\ 0\ 1\ 0\ 0]$ with filter (03)
$w = [1\ 2\ 3\ 2\ 8]$.

OR

Que. – 1 [12]

(a) Write the equation for mean and variance. Find the mean and variance for following Image. (05)

$$I = \begin{bmatrix} 0 & 0 & 1 & 1 & 2 \\ 1 & 2 & 3 & 0 & 1 \\ 3 & 3 & 2 & 2 & 0 \\ 2 & 3 & 1 & 0 & 0 \\ 1 & 1 & 3 & 2 & 2 \end{bmatrix}$$

(b) Equalize the given histogram with L=8. (04)

Gray Level	0	1	2	3	4	5	6	7
n_k	0	100	90	40	20	10	0	0

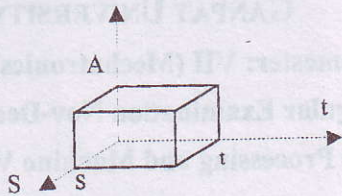(c) Write the equation for 1st and 2nd derivative and only find the 2nd derivative for the image given (03)
below.

7	7	7	6	5	4	3	2	1	1	2	4	5	3	2	1	5	6	7	7

Que. – 2 [11]

(a) Write the equation of DFT for 1D image, with use of that find the DFT of $f(x) =$ (06)
{0 1 2 1 2}

(b) Find the Fourier transform of following 2D step function shown in below figure. (05)

Que. – 3 Write any three [12]

(a) Find the Huffman code for following symbols. (04)

Symbol	a₁	a₂	a₃	a₄	a₅	a₆
Probability	0.1	0.4	0.07	0.1	0.03	0.3

(b) Discuss Bit-plane coding. (04)

(c) Discuss Butterworth and Gaussian low-pass filter. (04)

(d) Discuss Gamma transformation (04)

Section – II

Que. – 4 [12]

(a) A rectangle is formed by four points ABCD, whose coordinates are A(50,50), B(100,50),C(100,80), (50,80). Calculate the new coordinates of rectangle in reduced size using scaling factors, Sx=0.5 and Sy= 0.6. (03)

(b) Explain the concept of homogeneous and inverse perspective transformation. (03)

(c) Describe the CCD line scan and area scan sensor. (03)

(d) Explain the Region Merging and Splitting. (03)

Que. – 5 [11]

(a) Explain with diagram the construction and working of a Vidicon tube. (06)

(b) Explain with block diagram the Machine vision system with technical example. (05)

OR

Que. – 5 [11]

(a) Discuss with the theme example the fundamental steps of DIP. (06)

(b) Explain the Camera model. (05)

Que. – 6 Write Following: [12]

(a) Differentiate between LCD and LED display. (03)

(b) Briefly discuss the concept of sampling and quantization with figure. (03)

(c) Explain the concept of Perspective transformation. (03)

(d) Discuss the theory of finding the missing depth information. (03)

END OF PAPER