

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/ Backlog), Nov.-Dec. 2015
M. Tech in Electronics & Communication Engineering, Semester III

Roll No.....

MTEC322: Digital Image Processing

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A Objective type multiple choice questions (10 questions @ 1 mark)

10

- i. Convolution in spatial domain is multiplication in
 - (a) Frequency domain
 - (b) Spatial domain
 - (c) Time domain
 - (d) Plane
- ii. Contraharmonic mean can be used for
 - (a) Salt noise
 - (b) Pepper noise
 - (c) Both salt and pepper noise
 - (d) None
- iii. For pixels p, q , and z , with coordinates (x, y) , (s, t) , and (v, w) , respectively, D is a distance function or metric if
 - (a) $D(p, q) \geq 0$ ($D(p, q) = 0$ iff $(p = q)$)
 - (b) $D(p, q) = D(q, p)$
 - (c) $D(p, z) \leq D(p, q) + D(q, z)$
 - (d) All of these
- iv. Opening with rolling SE
 - (a) Sharps
 - (b) Smooths
 - (c) Shrinks
 - (d) Deletes
- v. Given affine matrix is related to which kind of transformation?
$$\begin{bmatrix} c_x & 0 & 0 \\ 0 & c_y & 0 \\ 0 & 0 & 1 \end{bmatrix}$$
 - (a) Scaling
 - (b) Translation
 - (c) Shear (vertical)
 - (d) Identity
- vi. The pixels having a D_4 distance from (x, y) less than or equal to some value r form a centered at (x, y) .
 - (a) circle
 - (b) diamond
 - (c) square
 - (d) None of these
- vii. Duality principle is used when SE is
 - (a) Square
 - (b) Symmetric
 - (c) Asymmetric
 - (d) Translated
- viii. Reflection is applied on image's
 - (a) X coordinate
 - (b) Y coordinate
 - (c) Z coordinate
 - (d) Both A and B
- ix. Structuring element is also called
 - (a) Pixels
 - (b) lines
 - (c) subimage
 - (d) noise
- x. Two main operations of morphology are
 - (a) Erosion
 - (b) Dialation
 - (c) Set theory
 - (d) Both A and B

- Q.2 Short answer type questions (4 questions @ 2.5 marks) 10
- Explain bit plane slicing.
 - Explain the segmentation.
 - Explain the difference between Flat and Nonflat Structuring elements.
 - Explain the duality between dilation and erosion.

- Q.3 Explain the basic concepts of sampling and quantization with neat sketch. 10

- Q.4 Explain the followings: 10
- | | |
|----------------------------|--------------------------------|
| (a) Arithmetic mean filter | (c) Harmonic mean filter |
| (b) Geometric mean filter | (d) Contraharmonic mean filter |

- Q.5 Explain opening and closing in detail with suitable examples and proper diagrams. 10

- Q.6A Consider the image segment shown. Let $V = \{0, 1\}$ and compute the lengths of the shortest 4-, 8-, and m-path between p and q. If a particular path does not exist between these two points, explain why. 05

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      1 1 2 1(q)
      2 2 0 2
      1 2 1 1
      (p)1 0 1 2

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- Q.6B Assuming continuous intensity values, suppose that an image has the intensity PDF $p_r(r) = 2r/(L-1)^2$ for $0 \leq r \leq (L-1)$ and $p_r(r) = 0$ for other values of r. Find the transformation function that will produce an image whose intensity PDF is $p_z(z) = 3z^2 / (L-1)^3$ for $0 \leq z \leq (L-1)$ and $p_z(z) = 0$ for other values of z. 05

- Q.7 Explain the detection of Isolate points and line in detail with examples. 10

OR

- Q.7 An alternative definition of erosion is 10
- $$A \ominus B = \{ w \in Z^2 \mid w + b \in A, \text{ for every } b \in B \}.$$
- Show that this definition is equivalent to the definition
- $$A \ominus B = \{ Z \mid (B)_z \cap A^c = \emptyset \}.$$

- Q.8 Explain the followings in detail: 10
- | | |
|----------------------------------|-------------------------------|
| (a) Ideal low pass filters | (c) Gaussian low pass filters |
| (b) Butterworth low pass filters | |

- Q.9A Give the noise probability functions of any five noises and draw the plot for each. 10

- Q.9B Explain thinning and thickening in detail with proper examples and diagrams. 10

OR

- Q.9B Explain histogram processing. Also explain the histogram equalization in detail with one example. 10