



Name :

Roll No. :

Invigilator's Signature :

CS/B.Tech(IT)/SEM-7/IT-703B/2012-13

2012

IMAGE PROCESSING AND GIS

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

- i) The image function $f(x, y)$ is characterized by two components :

$$f(x, y) = i(x, y) \cdot r(x, y)$$

where

- a) $0 < i(x, y) < 1$ and $0 < r(x, y) < \infty$
- b) $0 < i(x, y) < 1$ and $0 < r(x, y) < 1$
- c) $0 < i(x, y) < \infty$ and $0 < r(x, y) < \infty$
- d) $0 < i(x, y) < \infty$ and $0 < r(x, y) < 1$



ii) Consider an image of size $M \times N$ with 256 gray levels.

The total number of bits required to store this digitized image is

a) $M \times N \times 256$ b) $M \times N \times 255$

c) $M \times N \times 8$ d) None of these.

iii) The effect, caused by the use of an insufficient number of gray levels in smooth areas of a digital image is called

a) False contouring b) Gray level slicing

c) Bit plane d) None of these.

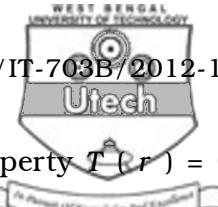
iv) The D_8 distance (chessboard distance) between p and q with co-ordinates $(x, y), (s, t)$ is defined as

a) $D_8(p, q) = |x - s| + |y - t|$

b) $D_8(p, q) = \max(|x - s|, |y - t|)$

c) $D_8(p, q) = [(x - s)^2 + (y - t)^2]^{1/2}$

d) none of these.



- v) A transformation function with the property $T(r) = 0$ for r in the range $[x, y]$ and $T(r) = 255$ for r in the range $[p, q]$ produces an image of the 7th bit plane is an 8-bit image where x, y, p, q are
- a) $x = 128, y = 255, p = 0, q = 128$
 - b) $x = 0, y = 127, p = 128, q = 255$
 - c) $x = 0, y = 63, p = 64, q = 127$
 - d) none of these.
- vi) A spatial averaging filter in which all co-efficients are equal is called a
- a) Weighted average filter
 - b) box filter
 - c) median filter
 - d) none of these.



vii) is a common technique for enhancing the appearance of images

- a) Splitting and merging
- b) Region growing
- c) Watershed segmentation
- d) Histogram equalization.

viii) The convolution of two functions $f(x, y)$ and $g(x, y)$

denoted by $f(x, y) * g(x, y)$ is defined as

- a)
$$f(x, y) * g(x, y) = \int_0^{\infty} f(\alpha, \beta) g(x - \alpha, y - \beta) d\alpha d\beta$$
- b)
$$f(x, y) * g(x, y) = \int_{-\infty}^{\infty} \int f(\alpha, \beta) g(x - \alpha, y - \beta) d\alpha d\beta$$
- c)
$$f(x, y) * g(x, y) = \int_{-\infty}^{\infty} \int g(\alpha, \beta) f(x - \alpha, y - \beta) d\alpha d\beta$$
- d) None of these.



ix) Give $F(u, v)$, the inverse Fourier transform is

$$\mathcal{F}^{-1}\{F(u, v)\} = f(x, y) \text{ where } f(x, y) \text{ is defined as}$$

a) $\int_{-\infty}^{\infty} \int F(u, v) \exp [J2\pi(ux + vy)] du dv$

b) $\int_{-\infty}^{\infty} \int F(u, v) \exp [J\pi(ux + vy)] du dv$

c) $\int_{-\infty}^{\infty} \int F(u, v) \exp [J4\pi(ux + vy)] du dv$

d) None of these.

x) Image Degradation causes

a) linearity of the optical sensor

b) relative motion between an object and camera

c) proper focus

d) None of these.



GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following.

$$3 \times 5 = 15$$

2. a) What is Weber ratio ?
b) Define 4-adjacency, 8-adjacency and m -adjacency.

$$2 + 3$$

3. a) What are gray image and binary image ?
b) What is salt and paper noise ?
c) What is the basic equation for getting a negative image ?

$$2 + 2 + 1$$

4. a) Write down the characteristics of perspective projection.
b) What is understood by vanishing point ? 4 + 1
5. What are image smoothing and image sharpening ? 5

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

6. a) What do you mean by image enhancement ? Explain.
b) What are Mean and Median filters ? Compare their performance.
c) Describe high pass filter and low pass filter. Explain when they are used. 4 + 6 + 5



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7. a) What is meant by GIS ?
b) What are the functions of GIS ?
c) What are the features of GIS ?
d) Discuss the 'contrast stretching' method for image enhancement. 3 + 3 + 4 + 5
8. a) What is digital image ? Discuss the fundamental step in digital image processing.
b) Briefly discuss the image acquisition technique using a sensor array.
c) What is spatial and gray-level resolution of a digital image ? 6 + 6 + 3
9. Write short notes on any *three* of the following : 3 × 5
- a) Discrete cosine transform
b) High and low pass filters
c) Properties of two-dimensional Fourier transform
d) Histogram Equalization.

