



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH(ECE)/SEP.SUPPLE/SEM-8/EC-803D/2012

2012

DIGITAL IMAGE PROCESSING

Time Allotted : 3 Hours

Full Marks : 70

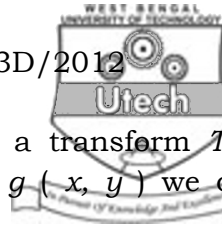
The figures in the margin indicate full marks.

*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) An image is a 2D array of
 - a) digital data
 - b) electrical signals
 - c) photographic objects
 - d) light signals.
- ii) A line sensor is used to
 - a) capture a scene
 - b) capture a 3D image
 - c) scan a 2D image
 - d) none of these.
- iii) What device is used to form an image on the film of a camera ?
 - a) A *p-n-p* transistor
 - b) A converging lens
 - c) An Op-Amp
 - d) A plane mirror.



- iv) If an input image is $f(x, y)$ and a transform T is operated to get an processed image $g(x, y)$ we can write
- a) $f(x, y) = T[g(x, y)]$ b) $f(x, y) = T/g(x, y)$
 c) $g(x, y) = T[f(x, y)]$ d) none of these.
- v) If a function $f(x, y)$ is real, and we have $F(u, v) = 2DFFT[f(x, y)]$,
- a) $F(u, v)$ contains only real parts
 b) $F(u, v)$ contains only imaginary parts
 c) $F(u, v)$ contains both real and imaginary parts
 d) none of these.
- vi) Edge detection of an image broadly means
- a) low spatial frequency enhancement
 b) high spatial frequency enhancement
 c) thresholding low spatial frequencies
 d) none of these.
- vii) If a function $f(x, y)$ is finite in the space domain, the Fourier transform of $f(x, y)$ will be
- a) finite b) infinite
 c) undefined d) zero.
- viii) The classical Hough transform is concerned with the identification of
- a) lines in an image b) zeros in an image
 c) poles in an image d) none of these.
- ix) A wavelet transform is a special case of
- a) Laplace transform b) Z-transform
 c) Fourier transform d) none of these.
- x) If we have an image in EPS and JPEG format
- a) the JPEG file will be larger in size
 b) the EPS file will be larger in size
 c) both files will be equal in size
 d) none of these.



GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following.

3 × 5 = 15

2. a) Write down the name of an image capturing technique/device.
b) Briefly explain the working principle of the image capture by that technique/device.
c) How can the captured images be transferred to a PC ?
1 + 3 + 1
3. a) What do you mean by image enhancement ?
b) Write about a transform or operation that can be used for image enhancement. Explain.
2 + 3
4. a) How do you represent a gray scale image ?
b) How do you represent a colour image ?
2 + 3
5. Write short notes on any *two* of the following :
a) Skeletonization of images
b) Thinning of images
c) Fourier descriptors.
2 × 2½

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following.

3 × 15 = 45

6. a) You are given a transformable image $g(x, y)$. Write down the expression for its continuous Fourier transform considering (u, v) the spatial frequency coordinate corresponding to the space coordinates (x, y) . What is the unit for spatial frequency ?
b) Write down the expression for the N point discrete Fourier transform.
c) Write down the expression for N point Fast Fourier transform and explain how it is faster than the discrete Fourier transform algorithm.
3 + 2 + 10



7. a) What do you mean by smoothing and sharpening of an image ?
 b) Somebody has captured a photograph as shown in figure below.
 i) If we want to remove the horizontal lines and get a clear image of the letter 'D', what we have to do ?
 ii) Can you get an image of the lines and remove the letter 'D' ? Explain your answers with flow diagrams wherever appropriate.



($2\frac{1}{2} + 2\frac{1}{2}$) + 5 + 5

8. a) What is meant by image segmentation ?
 b) What is meant by image compression ?
 c) Name a transform that can be used for image compression and explain how it can be used for image compression. $2\frac{1}{2} + 2\frac{1}{2} + 10$
9. a) What do you mean by image recognition ?
 b) What is meant by classification of image ?
 c) Describe any image recognition technique. How is it used for image classification ? $2 + 3 + 10$

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