



Name :

Roll No. :

Invigilator's Signature :

CS/M.Tech(CSE-OLD)/SEM-3/CS-1111/2012-13

2012

IMAGE PROCESSING AND PATTERN RECOGNITION

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.

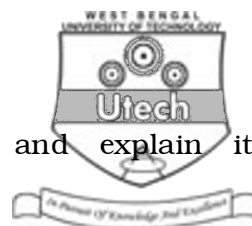
Attempt any five from the following.

1. a) In what different ways an image can be captured ?
Differentiate between analog and digital images.
- b) Explain the imaging transformation inside camera and derive its matrix form.
- c) Derive the logic of stereo imaging. 2 + 6 + 6
2. a) Mention some desirable properties of image transforms.
Why Fourier Transform is so important in image processing ?
- b) Derive the Fourier Transformation matrix for a one dimensional image of size 1×4 . Apply this transformation over the following image to show that the process is reversible.

2	4	2	1
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- c) Explain Translation property of Fourier Transformation.

2 + 8 + 4



3. a) Write down convolution theorem and explain its importance in image processing.
- b) Perform linear and periodic convolutions of the following image f (upper array) and the spatial mask h (lower array) given below.

2	4	2	5	1	7
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1	- 2	1
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- c) Write down some spatial masks used in image processing and mention their usage in image smoothing and sharpening. 2 + 8 + 4
4. a) How can we enhance an image in Frequency domain ? Explain the procedure.
- b) Derive functional forms for Ideal Low and High pass filters and describe them with functional diagrams.
- c) Compute the approximate gain in computation time to perform convolution in frequency domain over that in the spatial domain, when the image size and the mask size are 64×64 and 8×8 respectively. 2 + 8 + 4
5. a) Define Pattern Recognition. And describe different steps of pattern recognition with a clear diagram.
- b) Derive the Bayes rule for computing posterior probabilities from a priori probabilities.
- c) Explain the significance of Bayes Classification in Machine Learning. 4 + 6 + 4



6. a) What are the differences between Clustering and Classification ?
- b) Two classes of one dimensional data are given in two sets as C1 (2, 3, 4, 5) and C2 (10, 11, 12, 13). You need to classify the new data having value 9. Explain how can you do this using k -NN method. Show tracing steps.
- c) For what situation your method reduces to deterministic process ? 4 + 8 + 2
7. Write short notes on any *two* of the following : 7 + 7
- a) Image smoothing by averaging
 - b) Laplacian Edge Detector
 - c) K -means Clustering.
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