Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech(ECE)/SEM-2/MCE-205B/2012

2012

IMAGE PROCESSING & 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.

GROUP – A

Answer *all* questions.

1. a) What is clustering ? Give one example of clustering. 2

   b) What do you mean by Character Recognition ? 2

   c) Write down the applications of Clustering. 3

   d) Why is "Backpropagation Algorithm" so called ? 2

   e) What is the difference between Sobel edge operator and Prewitt edge operator ? 3

   f) What is binary neighbourhood encoding ? 2

GROUP – B

Answer any *two* of the following. 2 × 14 = 28

2. a) Explain the Perceptron Algorithm.

   b) We have a discriminant line or decision line defined by $x_1 + x_2 - 0{\cdot}5 = 0$, $\rho_t = 0{\cdot}7$ that line classifies correctly all the vectors except $[\,0.4.0.05\,]^T$ and $[\,-0.2,\ 0.75\,]^T$. Design a new classifier to classify all the vectors correctly. 6 + 8

3. a) Explain the least square method.

   b) What do you mean by "Reward and Punishment Method" ? In a 2D space we have four points (– 1, 0) (0, 1) belongs to class W_1 and points (0, – 1) (1, 0) belongs to W_2. Design a linear classifier using Preceptron Algorithm in its "Reward and Punishment Method" the parameter ρ is set equal to one and initial weight vector is chosen as $W(0) = [\,0, 0, 0\,]^T$. 6 + 8

4. a) What are the targets of Back Propagation Algorithm ?

   b) Compute the Gradients of Back Propagation Algorithm.

   c) What do mean by "Squashing Function" ? 3 + 9 + 2

GROUP – C

Answer any *two* of the following. 2 × 14 = 28

5. a) Explain Dirac delta function. Prove sampling theorem from Dirac delta function.

   b) What is the connectivity of a gray level image ?

c) Explain the algorithm of connected component labelling.

d) Explain adjacency of two pixel. 1 + 2 + 3 + 5 + 3

6. a) What is translation operator ? Explain 2D translation.

b) Derive the transformation matrix for 2D translation and 3D translation.

c) Explain application of point operations.

d) Explain Rate distortion theory.

e) Explain City block distance and Chess board distance.

1 + 2 + 2 + 2 + 2 + 2 + 3

7. a) What is skeletonization ? How do you obtain the skeleton of an image ?

b) What is 8-neighbours of a pixel ?

c) What is Erosion and Dilation of Morphological image processing ?

d) Write short note on colour image processing.

e) What is Histogram equalization ? 1 + 2 + 3 + 2 + 3 + 3