

**IV B.Tech I Semester Supplementary Examinations, April/May 2005**  
**DIGITAL IMAGE PROCESSING**

( Common to Electronics & Communication Engineering, Bio-Medical  
 Engineering, Electronics & Telematics and Electronics & Computer  
 Engineering)

Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. (a) Explain the adaptive pattern recognition system with necessary functional block diagram.  
 (b) Explain with necessary examples how to generate the pattern vectors?
2. (a) What is the relation between error probability of 1-NN rule and Bayes probability of error.  
 (b) Explain the stylized character recognition system with the help of flow chart.
3. (a) State and prove perceptron convergence theorem.  
 (b) Draw the basic perceptron model and explain the reward - punishment concept.
4. (a) Explain how the recognition grammars are selected?  
 (b) Explain how the statistical considerations incorporated into the syntactic approach to account for measurement of random noise.
5. With the help of a block diagram explain the different stages of image processing and analysis schemes along with the information flow from each block.
6. (a) Write a note on the following:
  - i. image subtraction
  - ii. image averaging
 (b) Show that a high pass filtered image can be obtained in the frequency domain as High pass = original - low pass (assume 3x3 filters)
7. (a) Briefly explain about image compression.  
 (b) How image compression is helpful in medical imaging?
8. (a) A binary image contains straight lines oriented horizontally, vertically diagonally at  $45^\circ$  and  $-45^\circ$ . Give a set of  $3 \times 3$  masks that can be used to detect one -pixel-long breaks in these lines. Assume that the gray level of the lines is 1 and that the gray level of the background is 0.  
 (b) Prove that the average value of the Laplacian operator  $\nabla^2 h = \left( \frac{r^2 - \sigma^2}{\sigma^4} \right) \exp \left( -\frac{r^2}{2\sigma^2} \right)$  is zero.

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