B.Tech.
(SEM. VII) ODD SEMESTER THEORY
EXAMINATION 2012-13
DIGITAL IMAGE PROCESSING

Time : 3 Hours
Total Marks : 100

Note :- Attempt all questions.

1. Attempt any four of the following :- (5×4=20)

(a) Explain sampling and quantization. Explain the effects of reducing sampling and quantization.

(b) What do you mean by image processing? Explain the steps in image processing with the help of block diagram.

(c) Give various grey level slicing techniques. What is Contrast Stretching?

(d) Classify image restoration techniques. If a car is moving at a constant speed of 80 km/h and an image is taken, is it possible to use a wiener or inverse filter to restore the blurring of image?

(e) Suppose that A, B, C are three points Prove that :

\[ ((A\cdot B) \circ C) \cdot B \circ C = (A\cdot B) \circ C \]

(f) Explain the thresholding method of segmentation.
2. Attempt any two of the following: \((10\times2=20)\)

(a) Explain the steps involved in sampling and digitization of images. How many minutes are required for a \(512 \times 512\) image with 256 grey levels at 300 baud rate for transmission? The transmission is accomplished using packets consisting of a start bit, a byte (8 bits) of information and a stop bit. Baud rate means number of bits per second.

(b) (i) Explain the action of the following spatial mask on an image.

\[
\begin{array}{ccc}
0 & -1 & 0 \\
-1 & 4 & -1 \\
0 & -1 & 0 \\
\end{array}
\]

(ii) Write short note on mean filter.

(c) Describe any one image sharpening method in detail.

3. Attempt any two of the following: \(10\times2=20\)

(a) Write a note on Noise Models in image restoration. Describe WIENER Filter and Inverse Filtering.

(b) Given an image, write down the 8 chain code and find Shape Number of it.
(c) Suppose two discrete one dimensional functions are represented by the sequences:

\[ f = [5 \ 7 \ 11 \ 8 \ 2 \ 6 \ 8 \ 9 \ 7 \ 4 \ 3] \]
\[ h = [1 \ 2 \ 1]. \]

Compute \( f + h, f \Theta h, f \circ h, f \cdot h \)

4. Attempt any two of the following: \( (10 \times 2=20) \)
   (a) Discuss the following:
      (i) Convex HUQ
      (ii) Logic operations involving binary images.
   (b) What do you mean by thinning and thickening of an image? Discuss the method for thinning of an image.
   (c) What do you mean by morphology? Discuss any one morphological algorithm with suitable example.

5. Attempt any two of the following: \( (10 \times 2=20) \)
   (a) Write short notes on:
      (i) Watershed Segmentation Algo
      (ii) Feature Thresholding in Pixel Based Approach.
(b) Describe the region based segmentation. Apply the region splitting on following image. Assume the threshold value be $\leq 3$.

<table>
<thead>
<tr>
<th>5</th>
<th>6</th>
<th>4</th>
<th>7</th>
<th>4</th>
<th>5</th>
<th>5</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>7</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

(c) Describe any one depth recover algorithm in detail.