Dept. of Computer Engineering
First Exam, First Semester: 2010/2011

Course Title:	Topics in Computer and Software Engineering	Date:	24/11/2010
Course No:	630593	Time Allowed:	1 Hour
Lecturer:	Dr. Qadri Hamarsheh	No. Of Pages:	2

Information for candidates
1. *This examination paper contains 5 questions totaling 15marks*
2. *The marks for parts of questions are shown in round brackets.*

Advices to candidates
        ☺ - *You should attempt all questions.*   ☺ - *You should write your answers clearly.*
Basic notions: *The aims of the questions in this part are to evaluate the required minimal student knowledge and skills. Answers in the pass category represent the minimum understanding of basic concepts: Image Processing Systems, Relationships between pixels and Distance Measures.*

Question 1   *(3 marks)*
Multiple choices (circle the most appropriate one):
   1. MRI Technology is an application of --------- band.
           a) EM Spectrum
           b) Acoustic
           c) Ultrasonic
           d) Electronic
   2. The image type that must contain a colormap array is called ---------.
           a) True color
           b) Binary
           c) Indexed
           d) Grayscale
   3. Computer vision defined as a discipline in which ----------
           a) both the input and output of a process are images.
           b) the input of a process is an image description and the output is image
           c) both the input and output of a process are descriptions.
           d) the input of a process is an image and the output is an image description.

Question 2   *(3 marks)*
   a) The following matrix represents a binary image, how many 8-connected and 4-connected objects this matrix has?   *(1.5 marks)*

$$
\begin{matrix}
1 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 1 & 0 & 0 & 0 \\
0 & 1 & 0 & 1 & 0 & 0 \\
0 & 0 & 0 & 1 & 1 & 0 \\
0 & 1 & 0 & 1 & 1 & 0 \\
0 & 0 & 0 & 0 & 0 & 1 \\
\end{matrix}
$$

   b) Give the formula for calculating D4 (city block distance) and D8 distance (chess board distance) of the digital image.   *(1.5 marks)*

Familiar and Unfamiliar Problems Solving: The aim of the questions in this part is to evaluate that the student has some basic knowledge of the key aspects of the lecture material and can attempt to solve familiar and unfamiliar problems of low-level and high level digital image programming using MATLAB.

Question 3 (3 marks)

Write a matlab function called **GetBinary** that accepts the following arguments: gray image **I, lowlimit** and **highlimit**, the function finds all image' pixels that are in the domain **[lowlimit , highlimit]** and returns a binary matrix **F** that is of the same size as **I**, where 1 for pixels satisfying the domain condition and 0 otherwise.

HINT: Use low-level processing (for loop structure)

Question 4 (2 marks)

Write a Matlab function; call it "**imenhance1**" that accepts a gray image (call it **f**) and returns the enhanced of that image (call it **g**) using the following equations:

$$g = (f - 64)/128 * 255$$

Where g is the output image, f is the input image,

- Display the input and the output images in your code.
- Use high-level processing (vectorization)

Question 5 (4 marks)

Write a matlab function that accepts a gray or a binary image (call it **f**) and returns the negative of that image (call it **g**) using the following equations:

```
g = 255-f;      for uint8 image data
g = 1-f;        for logical image data
```

- Use preallocating arrays for the output image.
- Use low-level processing.

GOOD LUCK