ublic of Yemen
z University
aculty of Engineering & Info. Techn.

IT & SE Department (Level 5)
Subject: (Digital Image Processing)
Lecturer: Dr.Mogeeb A. A. Mosleh

Academic Session : 2017/2018 Mid-Term Exam Duration : 2.5 h

*Answer **ALL** questions (2 pages) (100 marks).*

Question 1 (30 marks).

Multiple choices (circle the most appropriate one):

1) Dilation-Morphological image operation technique is used to
a) shrink brighter areas of the image b) diminishes intensity variation over the image
c) expands brighter areas of the image d) scales pixel intensity uniformly

2) Image compression is.
a) making image look better b) sharpening the intensity-transition regions
c) minimizing degradation over image d) reducing the redundancy of the image data

3) The dominant application of imaging in the microwave band is.
a) Radar b) satellite c) communication d) None

4) What's recognition?
a) It's the process that assigns a label to an object based on its descriptors.
b) it's process of search a image c) a & b d) None

5) Frequency domain refers
a) its processing techniques are based on modifying the Fourier transform of an image.
b) its processing techniques are based on modifying the laplace transform of an image.
c) a & b d) None

6) Basic steps for filtering in the frequency domain
a) Fourier transform b) filter function c) Inverse Fourier transform d) all of these

7) Advantage of .....is finding the brightest points in an image.
a) max filter b) min filter c) median filter d) none of above

8) Advantage of ..... is finding the darkest points in an image.
a) max filter b) min filter c) median filter d) none of above

9) Color printer works by using
a) cyan, magenta, Yellow and black dynes b) red, magenta, Yellow and black dynes
c) cyan, blue, Yellow and black dynes d) none of above

10) An image of size 1024 × 1024 pixels in which the intensity of each pixel is an 8 bit quantity requires the storage space (if not compressed)
a) 1 KB b) 1 MB
c) 2 KB d) 2 MB

Question 2 (30 marks).

Suppose that you have been given the 3-bit 8x8 image shown in figure below. For the given image perform the following operations:

a) **Negation**
b) **Thresholding with T=4**

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Question 2 (30 marks).

Suppose that you have been given the 3-bit 8x8 image shown in figure below. For the given image perform the following operations:

a) Negation
b) Thresholding with T=4

c) Intensity level slicing with background with r1 =2 and r2= 5
d) Plot the image histogram, and find probability density function (PDF)?
e) Perform Histogram equalization and then plot the equalized histogram
f) Find the output image g(x,y) using Power Law Transformation $g(x, y) = [f(x, y)]^2$, note that Power Law Transformation $s = r^{\gamma}$ where r and s are normalized input and output image pixel values.

0	5	7	7	5	8	7	8
7	2	6	2	6	5	6	8
6	9	7	7	0	7	2	7
6	6	1	7	6	1	7	5
9	6	0	7	8	2	6	7
2	8	8	2	7	6	7	8
7	3	2	6	1	7	5	8
9	9	5	6	7	7	7	7

Question 3 (40 marks).

A) Define the following terms:
Image, Brightness, gray level, hue of saturation, resolution, pixel, recognition, sampling and quantization, Luminance, contrast stretching, grey level slicing, image subtraction, histogram, Image Restoration, and segmentation?

B) What is the amount of memory required to store a RGB image with size W x H? Assuming each color channel uses 8 bits for storage and there is no compression of image?

C) What are the difference between HSI (HSV) color channels and RGB color channels? Why do we need different color channel representation?

D) What is Nyquist sampling rate? How does it affect image resolution?

E) Discuss Dilation and Erosion process, and why it used for?

F) Describe the segmentation process, benefits, segmentation algorithm and methods?

Best of Luck

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SE & IT Department (Level 5)
Subject: (Digital Image Processing)
Lecturer: Dr. Mogeeb A. A. Mosleh

Academic Session : 2017/2018 Final Exam Date: 26-2-2018 Duration : 4 h

*Answer **ALL** questions (3pages) (100 marks).*

Question 1 (30 marks)

Multiple choices (circle the most appropriate one):

1) Which of the following is a receptor in the retina of human eye?
   a) Rods b) Cones c) Rods and Cones d) Neither Rods nor Cones
2) What is the function of Iris?
   a) Source of nutrition b) Detect color c) Varies focal length d) Control amount of light
3) Ratio of number of rods to the number of cones is _____
   a) 1 20 b) 1 2 c) 1 1 d) 1 5
4) Two regions are said to be _____ if their union forms a connected set.
   a) Adjacent b) Disjoint c) Closed d) None of the Mentioned
5) For a region R, the set of points that are adjacent to the complement of R is called its _____
   a) Boundary b) Border c) Contour d) All of the Mentioned
6) What are the basic quantities that are used to describe the quality of a chromatic light source?
   a) Radiance, brightness and wavelength b) Brightness and luminance
   c) Radiance, brightness and luminance d) Luminance and radiance
7) What is the quantity that is used to measure the total amount of energy flowing from the light source?
   a) Brightness b) Intensity c) Luminance d) Radiance
8) Which of the following step deals with tools for extracting image components those are useful in the representation and description of shape?
   a) Segmentation b) Representation & description c) Compression
   d) Morphological processing
9) To convert a continuous sensed data into Digital form, which of the following is required?
   a) Sampling b) Quantization c) Both Sampling and Quantization
   d) Neither Sampling nor Quantization
10) To convert a continuous image f(x, y) to digital form, we have to sample the function in _____
   a) Coordinates b) Amplitude c) All of the mentioned d) None of the mentioned
11) The transition between continuous values of the image function and its digital equivalent is called _____
   a) Quantization b) Sampling c) Restoration d) None of the Mentioned
12) What is the tool used in tasks such as zooming, shrinking, rotating, etc.?
   a) Sampling b) Interpolation c) Filters d) None of the Mentioned
13) The difference in intensity between the highest and the lowest intensity levels in an image is _____
   a) Noise b) Saturation c) Contrast d) Brightness

14) In a dark image, the components of histogram are concentrated on which side of the grey scale?
a) High b) Medium c) Low d) Evenly distributed

15) In _____ image we notice that the components of histogram are concentrated on the low side on intensity scale.
a) bright b) dark c) colorful d) All of the Mentioned

16) Histogram Equalization is mainly used for _____
a) Image enhancement b) Blurring c) Contrast adjustment d) None of the Mentioned

17) Two images having one pixel gray value 01010100 and 00000101 at the same location, are operated against AND operator. What would be the resultant pixel gray value at that location in the enhanced image?
a) 10100100 b) 11111011 c) 00000100 d) 01010101

18) What does the total number of pixels in the region defines?
a) Perimeter b) Area c) Intensity d) Brightness

19) The two steps, one is the creation of new pixel locations, and other is the assignment of gray levels to those new locations are involved in _____
a) Shrinking b) Zooming c) All of the mentioned d) None of the mentioned

20) Images quantized with insufficient brightness levels will lead to the occurrence of _____
a) Pixilation b) Blurring c) False Contours d) None of the Mentioned

Question 2 *(30 marks).*

Given following 8x8 image which is having 16 gray levels as shown in figure below. For the given image perform the following operations:

i. Negation
ii. Thresholding with T= 5
iii. Intensity level slicing with background with r1=2 and r2= 5
iv. Plot the image histogram, and find probability density function (PDF)?
v. Perform Histogram equalization and then plot the equalized histogram
vi. Find the output image g(x,y) using Power Law Transformation $g(x, y) = [f (x, y)]^2$
vii. Perform Zooming on the following Image by Replication and Linear Interpolation

9	9	9	10	9	7	10	7
7	7	9	7	8	7	10	10
8	8	8	8	10	9	9	9
10	10	8	8	9	9	7	9
7	9	10	9	10	8	7	8
10	9	7	7	10	10	10	7
9	7	10	9	8	9	7	9
8	8	10	7	9	9	8	7

c) Intensity level slicing with background with r1 =2 and r2= 5
d) Plot the image histogram, and find probability density function (PDF)?
e) Perform Histogram equalization and then plot the equalized histogram
f) Find the output image g(x,y) using Power Law Transformation $g(x, y) = [f(x, y)]^2$, note that Power Law Transformation $s = r^{\gamma}$ where r and s are normalized input and output image pixel values.

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Question 3 *(40 marks).*

Answer all the following Questions:

i. How can you sharpen an image, reduce its noise, and detect the edges?
ii. Is there any relation between edge detection and sharpening? Discuss!
iii. Describe histogram equalization and histogram matching as a tool for image enhancement. Can these tools be used for other important applications? Explain!
iv. Design 3x3 filters that can be used for detecting diagonal lines.
v. Write the expression to find the number of bits to store a digital image? And Find the number of bits required to store a 256 X 256 image with 32 gray levels?
vi. Define the following terms:
Image – Brightness - Gray level – Resolutions - illumination and reflectance- sampling and quantization.- contrast stretching - grey level slicing - masking - histogram equalization - Image Negatives - Median filter - Noise probability density function - Hue of saturation - segmentation - Image Restoration?
vii. Explain the basic relationships between pixels?
viii. What are the advantages of Median filter?
ix. What is meant by Image Restoration? And what are the three methods of estimating the degradation function?
x. In your opinion, what is the most interesting topic of this course? Explain how important this topic is in the context of image processing, and how important it is for your studies/job?

Best of Luck