The Islamic University in Gaza Faculty of Information Technology Master of Information Technology Image Processing	الإمتحان النهائي الفصل الأول 2021/2022 ICTS 6338	الجامعة الإسلامية بغزة كلية تكنولوجيا المعلومات ماجستير تكنولوجيا المعلومات المساق: معالجة الصور

Q1) Multiple Choice Questions (11 Pts)

41 Pts

1. **Digitizing the image intensity amplitude is called**
   (A) Sampling (B) Framing (C) Quantization (D) Both A and B

2. **Impulse noise in Order-statistic filter is also called as _____**
   A) Median noise B) Bilinear noise C) Salt and pepper noise D) Gaussian noise

3. **To improve the results of segmentation, it is suggested:**
   (A) to pre-process the image using a Sobel filter (B) to pre-process the image using a median filter
   (C) to post-process the results using a Sobel filter (D) to post-process the results using a median filter
   (E) to combine both Sobel and median filter

4. **Filter that performs opposite to band rejected filter is called:**
   (A) lowpass filter (B) bandpass filter (C) highpass filter (D) max filter

5. **One that is not a type of a noise is**
   (A) Rayleigh noise (B) gamma noise (C) black noise (D) exponential noise

6. **Ideal filters can be _____**
   (A) LPF B) HPF C) BPF D) All of the above

7. **Dilation followed by erosion is called:**
   (A) opening (B) closing C) blurring (D) translation

8. **Fully containment of the SE in an image is required in**
   A) erosion B) dilation C) opening D) closing

9. **For point detection we use?**
   (A) first derivative (B) second derivative (C) third derivative (D) Both A and B

10. **Image segmentation is the process of**
    (A) Partitioning a digital image into multiple segment B) Classify the image into number of object.
    C) A and B D) All of the above

11. **Algorithm stating that boundaries of the image are different from background is**
    (A) Discontinuity B) similarity C) extraction D) recognition

Q2) [10 Pts.] Solve the following Questions:

1. **[2 Pts.] There are two broad categories of image enhancement techniques; Spatial domain techniques and Frequency domain techniques. Distinguish between these two techniques.**

1. **[3 Pts.] The image given below is a 3*3:**

1	**7**	**5**
6	**2**	**3**
1	**4**	**2**

what will the value of the center pixel change to when this image is passed through:

a. **Arithmetic mean filter**

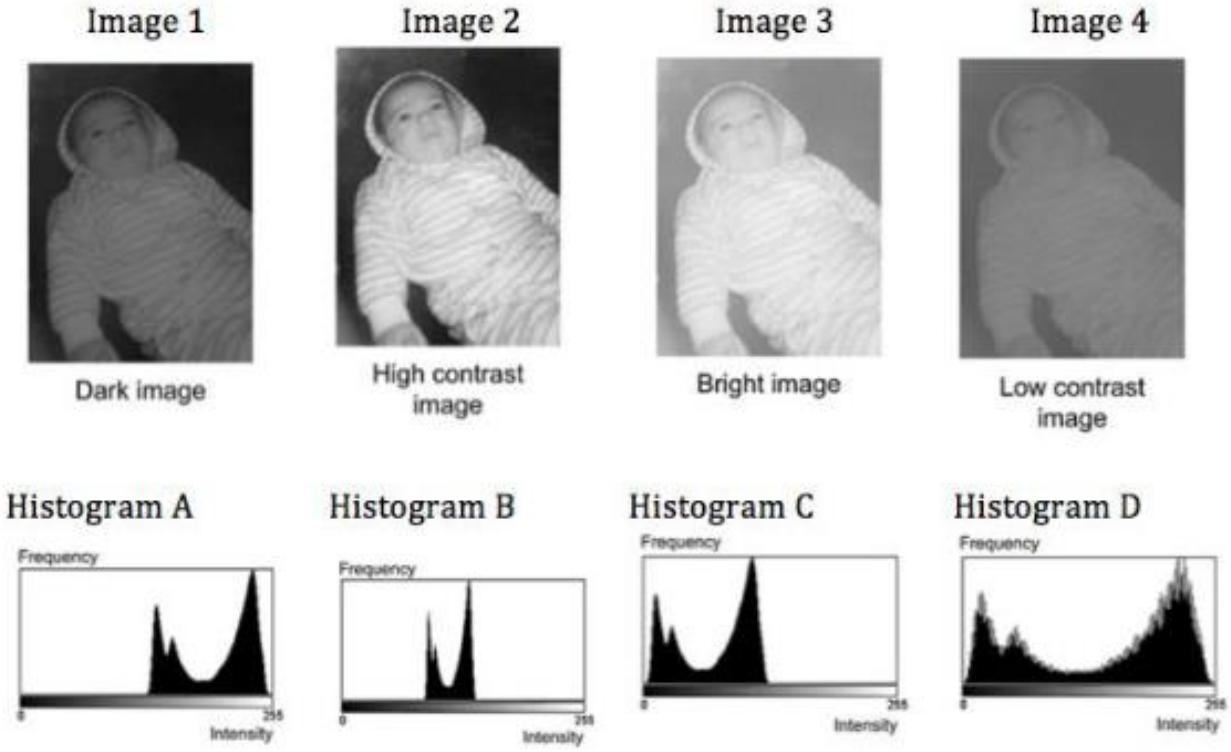
b. **Geometric mean filter**

c. **Harmonic mean filter**

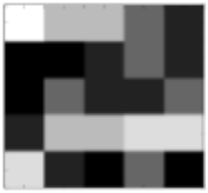
2. **[2 Pts.] Briefly explain the operation the Alpha-trimmed mean filter and write its equation? What are its uses for image processing?**

3. **[1 Pts.] Explain what you understand by Histogram Equalization.**

4. **[2 Pts.] Match the Images (1-4) below to their corresponding pixel histogram (A-D)**



Q3) [11 Pts.] Consider the following 5*5 image with respective pixel values.



180	160	160	140	120
110	110	120	140	120
110	140	120	120	140
120	160	160	170	170
170	120	110	140	110

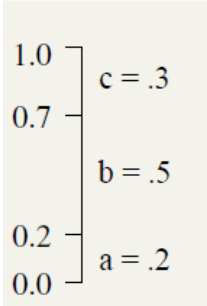
1. **[2 Pts] Provide the table of frequencies for each symbol**

2. **[2 Pts.] What is the minimum number of bits per symbol for this message (entropy)?**

3. **[3 Pts.] Provide the Huffman code for each symbol**

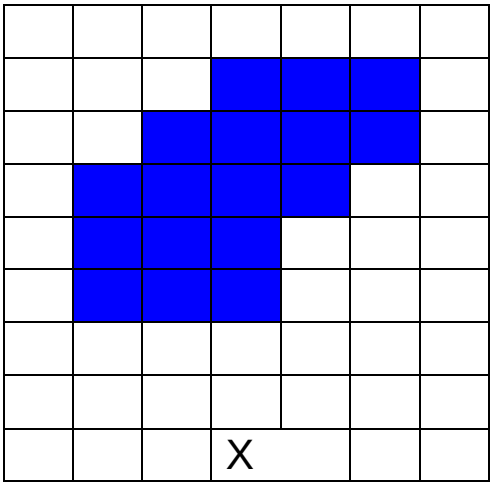
4. **[2 Pts.] Provide the average number of bits per symbol**

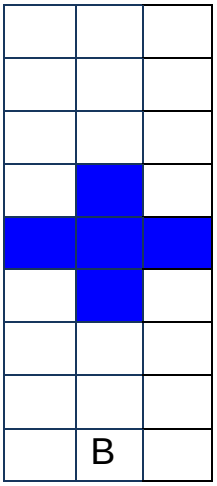
5. **[2 Pts.] Consider the following arithmetic coding, Decode the number .49**



Q4) [9 Pts.] Morphological operations

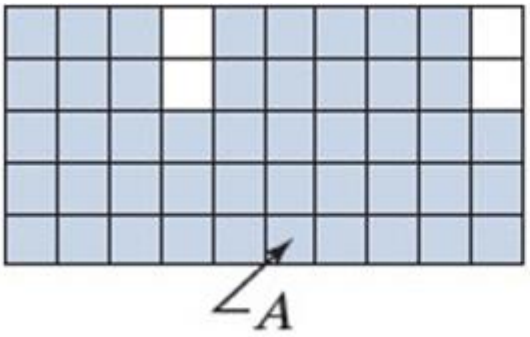
1. **[2 Pts.] A binary image X and a structure element B are given as follows:**

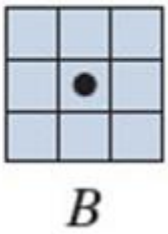




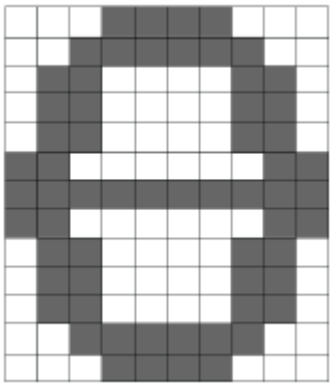
Calculate Y1= XΘB, where Θ denotes the morphological erosion operator and Y2= X⊕B where ⊕ denotes the morphological dilation operator.

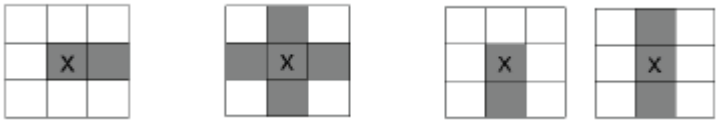
2. **[3 Pts.] Given the following binary mage A, explain how can you extract the boundary of the object using morphological erosion and binary subtraction.**





3. **[3 Pts] The following binary image represents the letter θ. What morphological operation should you use to obtain the number zero? Consider you can use any of the following structuring elements.**





4. **[1 Pts.] Problems arise in edge detection is that there are too much detail. One way to overcome this is to**

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