GENERAL SIR JOHN KOTELAWALA DEFENCE UNIVERSITY
Faculty of Engineering
Department of Electrical, Electronic and Telecommunication Engineering

BSc Engineering Degree (Intake 34)
Semester 4 Examination – November / December 2018
(Stream – EE/ET/MC)

IMAGE PROCESSING
(ET2223)

Time allowed: 3 hours

16 November 2018

ADDITIONAL MATERIAL PROVIDED

Nil

INSTRUCTIONS TO CANDIDATES

This paper contains 5 questions on 5 pages.

Answer ALL FIVE questions.

This is a closed book examination.

This examination accounts for 80% of the module assessment. A total maximum mark obtainable is 100. The marks assigned for each question and parts thereof are indicated in square brackets.

If you have any doubt as to the interpretation of the wordings of a question, make your own decision, but clearly state it on the script.

Assume reasonable values for any data not given in or provided with the question paper, clearly make such assumptions made in the script.

All examinations are conducted under the rules and regulations of the KDU.

113

QUESTION 1

a. Consider the following 4x4, 8 level images A & B. Find A+B, A-B, A x B & A/B.

[10 marks]

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

Image A

1	3	5	7
7	7	0	1
3	5	6	7
1	3	5	7

Image B

b. Perform the following logical operations on Images A and B.   [10 marks]

i.   A AND B.
ii. A OR B.
iii. B AND (NOT A).

```
1 0 0            1 1 1
1 1 1            1 1 1
0 0 1            1 1 1
```

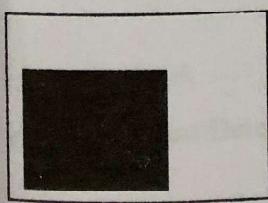Image A   Image B

QUESTION 2
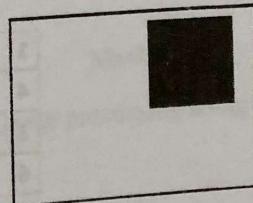
a. Perform the following logic operations on the images A and B.   [5 marks]

i.   NOT (A).
ii. (A) AND (B).
iii. (A) OR (B).
iv. (A) XOR (B).
v.   NOT(A) AND (B).

A

B

115

b. Perform the following operations on the given Image A and Structuring Element B.

[7.5 marks]

    i. Dilatation.
    ii. Erosion.

```
1 1 1 1 1 1
1 1 1 1 1 1
1 1 0 0 0 1 1
1 1 0 0 0 1 1
1 1 0 0 0 1 1
1 1 1 1 1 1
1 1 1 1 1 1
```

Image A

①1
1 1

Structuring Element B

c. Explain the following morphological operations with aid of a suitable diagram.

[7.5 marks]

    i. Closing.
    ii. Opening.

QUESTION 3

a. Briefly explain the following quality factors of an image. [4 marks]

    i. Contrast.
    ii. Brightness.
    iii. Spatial resolution.
    iv. Noise.

b. Assuming that grey level is 0—7(8 levels) apply the following transformations on the given image A.

[8 marks]

    i. Inversion.
    ii. Square $[g(x,y) = f(x,y)2]$.
    iii. Square root $[g(x,y) = (7xf(x,y))1/2]$.
    iv. Exponential $[g(x,y) = cx\ f^r(x,y);\ c = 1\ and\ r = 1.2]$.

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

Image A

c. Perform Biplane Slicing operation for the above image A to obtain MSB and LSB plane images.

[8 marks]

QUESTION 4

a. Explain the principle of Histogram Stretching with aid of a suitable diagram.

[4 marks]

b. Perform histogram stretching on the 8x8, 8 level grey image, the grey level distribution as shown in the table 1.   [8 marks]

Table 1

Grey Level(r_k)	0	1	2	3	4	5	6	7
Number of Pixels(p_k)	0	0	5	20	20	19	0	0

c. Perform Histogram equalization for the 8x8, eight level image as given in table 2.

[8 marks]

Table 2

Grey Level(r_k)	0	1	2	3	4	5	6	7
Number of Pixels(p_k)	8	10	10	2	12	16	4	2

QUESTION 5

a. Briefly explain the following degradation effect on images.   [4 marks]

i. Noise.
ii. Blur.
iii. Artefacts.

b. Apply the averaging filter on the given image A for given mask B.   [8 marks]

```
1 2 3 3 4 5
1 2 3 4 5 6
2 3 4 5 6 7
3 4 5 6 7 9
3 4 6 6 7 8
```

$$\frac{1}{9}X$$

1	1	1
1	1	1
1	1	1

Image A

Mask B

c. Explain the Line Detection method used in image processing using appropriate filters.

[8 marks]

[End of the question paper]