Solution Quiz 4
BESE 13
Digital Image Processing

3

1. Given the image A and structuring element S, compute the following:

0	0	0	0	0	0
0	0	**1**	**1**	**1**	0
0	**1**	0	0	**1**	0
0	**1**	**1**	**1**	**1**	0
0	0	**1**	**1**	**1**	0
0	0	0	0	0	0

A

X	X	X
1	1	1
X	0	X

S

$$B = A \otimes \hat{S}$$
$$B = A^c \cap (A \otimes S)$$
$$B = A^c \Theta S$$

Solution

a. Reflection of S is :

X	0	X
1	1	1
X	X	X

B is given by :

0	0	0	0	0	0
0	0	0	1	0	0
0	0	0	0	0	0
0	0	1	1	0	0
0	0	0	0	0	0
0	0	0	0	0	0

b. A^c is :

1	1	1	1	1	1
1	1	**0**	**0**	**0**	1
1	**0**	1	1	**0**	1
1	**0**	**0**	**0**	**0**	1
1	1	**0**	**0**	**0**	1
1	1	1	1	1	1

$A \otimes S$

0	0	0	0	0	0
0	0	0	**1**	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	**1**	0	0
0	0	0	0	0	0

$A^c \cap A \otimes S$

0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

c. $A^c \Theta S$

0	0	**1**	**1**	**1**	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

2. Represent the following images in form of sets:

0	0	0	0	0	0
0	**1**	**1**	**1**	**1**	0
0	**1**	0	0	**1**	0
0	**1**	0	0	**1**	0
0	**1**	**1**	**1**	**1**	0
0	0	0	0	0	0

a

50	150	50
125	1	200
0	250	0

b

Solution a : {(1,1), (1,2),(1,3),(1,4),(2,1),(2,4),(3,1), (3,4),(4,1), (4,2), (4,3), (4,4)}

Solution b : {(0,0,50), (0,1,150), (0,2,50),(1,0,125), (1,1,1), (1,2,200), (2,0,0), (2,1,250), (2,2,0)}

3. Apply region filling algorithm to the image ***'a'*** in question 2 and show the images from starting up to convergence.

Solution

0	0	0	0	0	0
0	**1**	**1**	**1**	**1**	0
0	**1**	0	0	**1**	0
0	**1**	0	0	**1**	0
0	**1**	**1**	**1**	**1**	0
0	0	0	0	0	0

Initial image A

1	1	1	1	1	1
1	0	0	0	0	1
1	0	1	1	0	1
1	0	1	1	0	1
1	0	0	0	0	1
1	1	1	1	1	1

A^c

	1	
1	1	1
	1	

B

Solution

For region filling, we select a point within the region and repeatedly apply the following :

$$X_k = (X_{k-1} \oplus B) \cap A^c$$

0	0	0	0	0	0
0	0	0	0	0	0
0	0	1	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

X_0

0	0	0	0	0	0
0	0	0	0	0	0
0	0	1	1	0	0
0	0	1	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

X_1

0	0	0	0	0	0
0	0	0	0	0	0
0	0	1	1	0	0
0	0	1	1	0	0
0	0	0	0	0	0
0	0	0	0	0	0

X_2

0	0	0	0	0	0
0	1	1	1	1	0
0	1	1	1	1	0
0	1	1	1	1	0
0	1	1	1	1	0
0	0	0	0	0	0

X_2 U A