Question 1:

Consider the two image subsets, S_1 and S_2 in the following figure. With reference to Section 2.5 in textbook, and assuming that $V = \{1\}$, determine whether these two subsets are:

(a) 4-adjacent. (8%)

(b) 8-adjacent. (8%)

(c) m-adjacent. (8%)

		S_1				S_2			
0	0	0	0	0	0	0	1	1	0
1	0	0	1	0	0	1	0	0	1
1	0	0	1	0	1	1	0	0	0
0	0	1	1	1	0	0	0	0	0
0	0	1	1	1	0	0	1	1	1

(a) False, because if we look at the boudries of this two images, we can find that there are two pixels diagonal.

0 1 → Diagonal
1 0

(b) True, Although these two image are not 4-adjacent. However, it's 8-adjacent because of there are diagonal pixels.

(c) True, beause it's not 4-adjacent but there are diagonal pixels, it's m-adjacent.

Question 2:

Consider the image segment shown in the figure that follows.

(a) As in Section 2.5, let $V = \{0,1\}$ be the set of intensity values used to define adjacency. Compute the lengths of the shortest 4-, 8-, and m-path between p and q in the following image. If a particular path does not exist between these two points, explain why. (8%)

(b) Repeat (a) but using $V = \{1,2\}$. (8%)

3	1	2	1 (q)
2	2	0	2
1	2	1	1
(p) 1	0	1	2

(a)

4-Path: No, It's not avaiable. It stucks at (2,3).

$$\begin{array}{ccccc} & & 2 & 1 \\ & & 0 & 2 \\ & & \uparrow & \\ & & 1 & \\ & & \uparrow & \\ 1 \to & 0 \to & 1 & \end{array}$$

8-path: Yes, it's avaiable. Its length is 4.

$$\begin{array}{cccc} & & 0 \nearrow & 1 \\ & & \uparrow & \\ & \nearrow & 1 & \\ 1 \to & 0 & 1 & \end{array}$$

m-path: Yes. Its length is 5.

$$\begin{array}{cccc} & & 2 & 1 \\ & & 0 \nearrow & 2 \\ & & \uparrow & \\ & & 1 & \\ & & \uparrow & \\ 1 \to & 0 \to & 1 & \end{array}$$

(b) $V = \{1, 2\}$

4-path: Its length is 6

3	1 →	2 →	1
2	2	0	2
1 →	2	1	1
1	0	1	2

8-path: Its length is 4

3	1	2 →	1
2	2	0	2
1	2	1	1
1	0	1	2

m-path: Its length is 6

3	1 →	2 →	1
2	2	0	2
1 →	2	1	1
1	0	1	2

(1) $q \in N_4(p)$

(2) $q \in N_D(p)$, $N_4(p) \cap N_4(q) = \phi$