Programming Assignment 1
(Due on September 15, 2018 by 11:59pm)

I. Questions (20%):

(1) (as 2.11) (4%) Consider the two image subsets, S1 and S2, shown in the following figure. For V = {1}, determine whether these two subsets are (a) 4-adjacent, (b) 8-adjacent, or (c) m-adjacent.

```
          S1              S2
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) No
B) Yes
C) Yes

(2) (as 2.15) (4%) Consider the image segment shown

    (a) Let V= {0,1} and compute the lengths of the shortest 4-, 8-, and m-path between p and q. If a particular path does not exist between these two points, explain why.
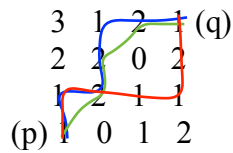
```
3 1 2 1 (q)
2 2 0 2
1 2 1 1
(p) 1 0 1 2
```

4) DNE — theres no way to get to 1 from p to q
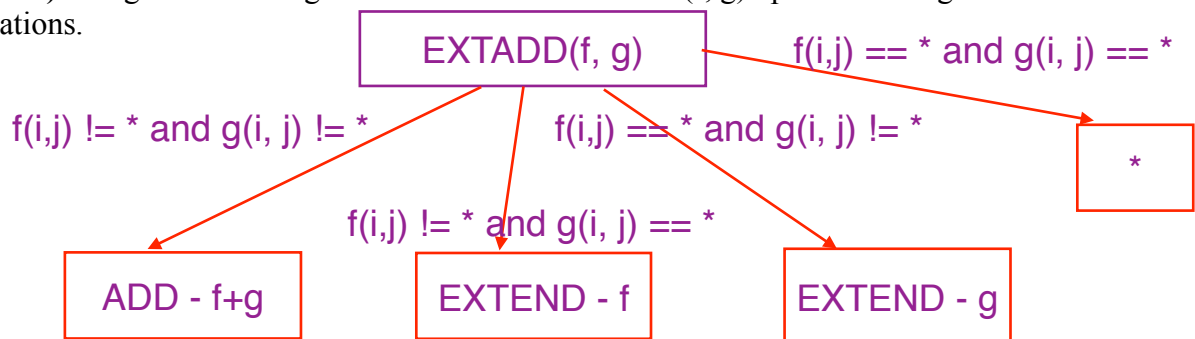
8) 5

m) 6

(b) Repeat for V = {1,2}.

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

(3) Based on the definition of EXTADD(f, g),

(a) (2%) Design a block diagram to realize the EXTADD(f, g) operation using ADD and EXTEND operations.

EXTADD(f, g)

f(i,j) == * and g(i, j) == *

f(i,j) != * and g(i, j) != *

f(i,j) == * and g(i, j) != *

*

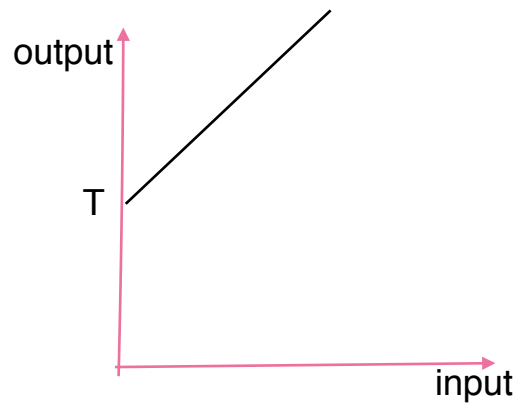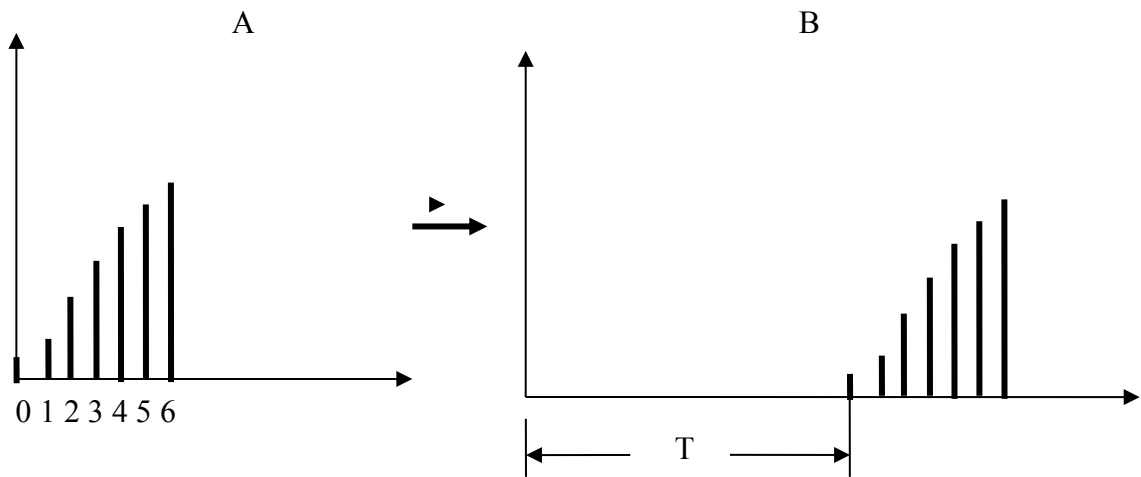f(i,j) != * and g(i, j) == *

ADD - f+g

EXTEND - f

EXTEND - g

(b) (2%) Compute the EXTADD(f, g), where $f = \begin{pmatrix} 3 & 5 & -2 \\ * & 0 & * \end{pmatrix}_{1,2}$; $g = \begin{pmatrix} 2 & 4 \\ 3 & 9 \\ -2 & * \end{pmatrix}_{2,2}$

$$EXTADD(f, g) = \begin{matrix} * & 2 & 4 \\ 3 & 8 & 7 \\ * & -2 & * \end{matrix}$$

(4) 4%

Given the following histogram (A), after a shifting by T, the histogram becomes (B).
Write a transformation function and plot the transformation curve for such a shifting transformation.

A   B

0 1 2 3 4 5 6

T

output

T

input

B = A(x-T)

(5) 4%

Give the histogram (A), after applying the transformation (C), plot the new histogram after the transformation.

A

255

output

C

255

0

255   input

255