Assignment 1

1)

a) Given, an image of 1200x1000 pixels with 8 bits grey level per pixel.
Total number of pixels are 1,200,000
Total number of bits are 1,200,000x8 = 9,600,000 bits => 9.6Mb
Modem can send 50Mb/sec.
.'. 9.6Mb can be sent in 9.6/50 = **0.192 s**

b) Time taken in a modem with 5Mb/sec is **1.92 s**

c) For RGB its 3x9.6Mb = 28.8Mb
Time = 28.8/50 = **0.576 s**.
For a modem with 5 Mb/sec it takes **5.76 s**.

d) Colored frame -> RGB
25 frames and each frame has RGB -> 25*3 = 75
5 sec video -> 75*5 = 375
Each frame/image is made up of 1.2M pixel.
.'. for 375 frames/images -> 1.2M*375 = 450M pixels.
Each pixel is 8 bits then 450M pixels = 3.6Gbits

3.6Gbits can be sent in **72 s** using a modem of 50Mb/s.
3.6Gbits can be sent in **720 s** using a modem of 5Mb/s.

2)

0	0	0	50	50	0	100	100	0	0	0	100	100	0	0
100	0	50	100	100	100	0	0	100	0	100	0	0	100	0
100	100	50	100	0	0	0	100	0	100	0	0	100	0	100
0	0	0	50	0	0	100	0	0	0	100	100	0	0	0
0	0	0	100	0	0	0	0	100	0	0	0	0	100	0
0	100	100	100	100	100	0	100	100	100	100	0	100	100	100

a) 4-Adjacent

0	0	0	A	A	0	B	B	0	0	0	C	C	0	0
A	0	A	A	A	A	0	0	D	0	E	0	0	F	0
A	A	A	A	0	0	0	G	0	H	0	0	I	0	J
0	0	0	A	0	0	K	0	0	0	L	L	0	0	0
0	0	0	A	0	0	0	0	M	0	0	0	0	N	0
0	A	A	A	A	A	0	M	M	M	M	0	N	N	N

b) 8-Adjacent

0	0	0	A	A	0	A	A	0	0	0	A	A	0	0
A	0	A	A	A	A	0	0	A	0	A	0	0	A	0
A	A	A	A	0	0	0	A	0	A	0	0	A	0	A
0	0	0	A	0	0	A	0	0	0	A	A	0	0	0
0	0	0	A	0	0	0	0	M	0	0	0	0	N	0
0	A	A	A	A	A	0	M	M	M	M	0	N	N	N

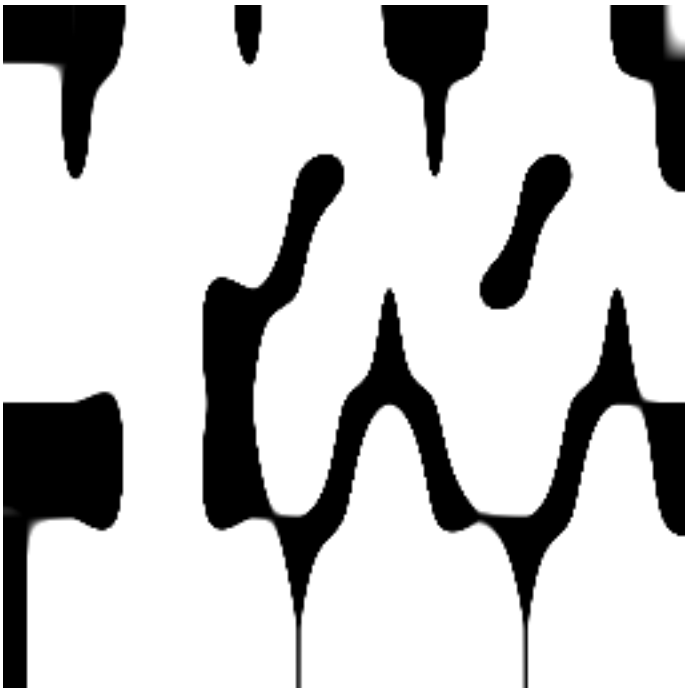
c) m-Adjacent

0	0	0	A	A	0	A	A	0	0	0	A	A	0	0
A	0	A	A	A	A	0	0	A	0	A	0	0	A	0
A	A	A	A	0	0	0	A	0	A	0	0	A	0	A
0	0	0	A	0	0	A	0	0	0	A	A	0	0	0
0	0	0	A	0	0	0	0	M	0	0	0	0	N	0
0	A	A	A	A	A	0	M	M	M	M	0	N	N	N

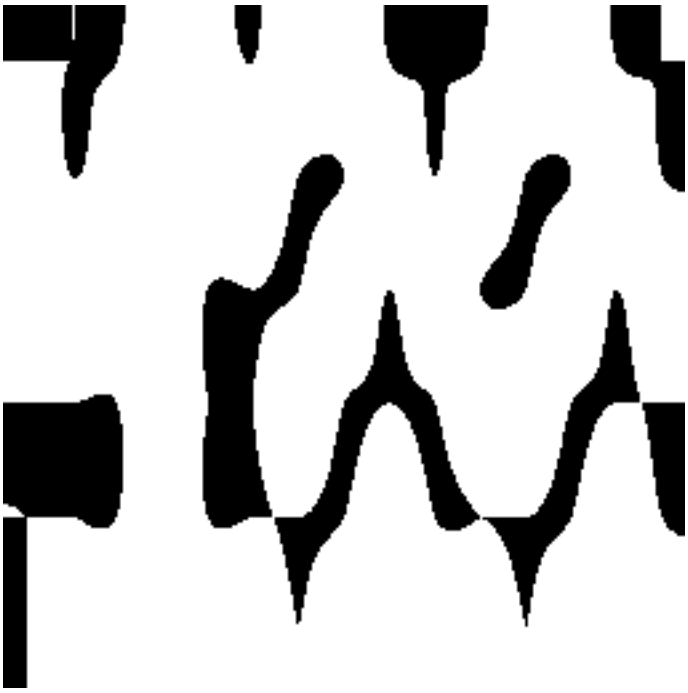
3)

a) I = [0,0,0,50,50,0,100,100,0,0,0,100,100,0,0;
100,0,50,100,100,100,0,0,100,0,100,0,0,100,0;
100,100,50,100,0,0,0,100,0,100,0,0,100,0,100;
0,0,0,50,0,0,100,0,0,0,100,100,0,0,0;
0,0,0,100,0,0,0,0,100,0,0,0,0,100,0
0,100,100,100,100,100,0,100,100,100,100,0,100,100,100;]

Ir = imresize(I,[256 256])
imshow(Ir)



b) Ibw = im2bw(Ir,0)
imshow(Ibw)



4)

a) Shortest 4 path between p and q → not possible because p and q are not in the same component in 4 adjacent connectivity.

A	10	B	10	10	B	B	B	B	B	B	B	B	B	B
A (p)	10	B	B	B	B	B	B	B	B	B	B	B	B	B
10	B	10	10	B	B	B	B	B	B	B	B	B	B	B
10	B	10	B	B	B	B	B	B	B	2	B	B	B	B
B	B	B	B	B	B	B	B	B	B	B	B	B	B	B (q)
B	2	B	B	2	B	B	B	B	B	B	B	B	B	B

Shortest 8 -connected path is 14.

A	10	A	10	10	A	A	A	A	A	A	A	A	A	A
A (p)	10	A	A	A	A	A	A	A	A	A	A	A	A	A
10	A	10	10	A	A	A	A	A	A	A	A	A	A	A
10	A	10	A	A	A	A	A	A	A	2	A	A	A	A
A	A	A	A	A	A	A	A	A	A	A	A	A	A	A (q)
A	2	A	A	2	A	A	A	A	A	A	A	A	A	A

Shortest m-connected path is 16.

A	10	A	10	10	A	A	A	A	A	A	A	A	A	A
A (p)	10	A	A	A	A	A	A	A	A	A	A	A	A	A
10	A	10	10	A	A	A	A	A	A	A	A	A	A	A
10	A	10	A	A	A	A	A	A	A	2	A	A	A	A
A	A	A	A	A	A	A	A	A	A	A	A	A	A	A (q)
A	2	A	A	2	A	A	A	A	A	A	A	A	A	A

b) No path from p to q because 0 is the background.
4-adjacent for V= {10,20}

A	A	A	A	A	0	B	B	0	0	0	C	C	0	0
A (p)	A	0	A	A	A	0	0	D	0	E	0	0	F	0
A	A	A	A	0	0	0	G	0	H	0	0	I	0	J
A	0	A	A	0	K	K	0	0	0	2	L	0	0	0
0	0	0	A	0	0	0	0	M	0	0	0	0	N	0 (q)
0	2	A	A	2	O	0	R	R	R	R	0	S	S	S

8-adjacent and m-adjacent for V={10,20}

A	A	A	A	A	0	A	A	0	0	0	A	A	0	0
A	A	0	A	A	A	0	0	A	0	A	0	0	A	0
A	A	A	A	0	0	0	A	0	A	0	0	A	0	A
A	0	A	A	0	A	A	0	0	0	2	A	0	0	0
0	0	0	A	0	0	0	0	B	0	0	0	0	C	0
0	2	A	A	2	D	0	B	B	B	B	0	C	C	C

c) p=(1,0) q=(4,14)
pq = sqrt($(1-4)^2+(0-14)^2$) = **14.317**