DIP MID-2 MONSOON-2018 ANSWER KEY

1. Based on the assumptions : either ABC are correct or only D is correct.
2. D
3. B
4. Opening - D; Dilation - A; Erosion - B ; Closing - C
5. A,B (4 marks awarded only if both are marked)
6. A, B (2 marks awarded only if both are marked)
7. A (1 mark for correct answer only)
8. D (1 mark for correct answer only)
9.

Erosion Output -

O	**O**	**O**	**O**	**O**	**O**
O	**O**	**O**	**O**	**O**	**O**
O	**O**	**X**	**X**	**O**	**O**
O	**O**	**X**	**X**	**O**	**O**
O	**O**	**O**	**O**	**O**	**O**
O	**O**	**O**	**O**	**O**	**O**

Dilation Output -

O	**O**	**O**	**O**	**O**	**O**
O	**X**	**X**	**X**	**X**	**O**
X	**X**	**X**	**X**	**X**	**X**
X	**X**	**X**	**X**	**X**	**X**
X	**X**	**X**	**X**	**X**	**X**
O	**X**	**X**	**X**	**X**	**O**

X - Shaded cells
O - Empty cells

Matlab Code to Reproduce Results -

```
I = [ 0 0 0 0 0 0; 0 0 1 1 0 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 ];
```

SE = [0 0 0 ; 1 1 1 ; 0 1 0];
Output = imdilate(I, SE);

10.

10.1

$$\mathbf{cCos\theta + rSin\theta = \rho}$$

(2 marks awarded if correct equation is written else 0)

10.2 Value of M = 8 (6 marks only awarded if entire calculation is correct, along with correct answer)
(partial marks have been given for working)

10.3

$$\mathbf{\rho, \theta = (5, \pm 90 \text{ degrees})}$$

(1 mark for value of Rho, and 1 mark for correct value of Theta)

Alternatively for Question 10 (Please take note of the Coefficients here)

10.1

$$\mathbf{rCos\theta + cSin\theta = \rho}$$

(2 marks awarded if correct equation is written else 0)

10.2 Value of M = 8 (6 marks only awarded if entire calculation is correct, along with correct answer)
(partial marks have been given for working)

10.3

$$\mathbf{\rho, \theta = (5, 0 \text{ degrees})}$$

11. Connected Components algorithm is considered for pixels marked as 1 and label only those pixels.
4- Connectivity

First Pass: (6 Marks)

Union Label Tree: 1<-3 from yellow marked cell, 2,4 (1 marks)

0	0	0	0	0	0	0	0
0	0	1	1	0	2	2	0
0	3	1	1	1	0	2	0
0	3	1	1	0	4	0	0

0	3	1	1	0	4	4	0
0	0	1	1	0	4	4	0
0	0	0	1	0	4	4	0
0	0	0	0	0	0	0	0

Second Pass: (3 Marks)
Replace 3 with 1, obtained from label tree.

0	0	0	0	0	0	0	0
0	0	1	1	0	2	2	0
0	1	1	1	1	0	2	0
0	1	1	1	0	4	0	0
0	1	1	1	0	4	4	0
0	0	1	1	0	4	4	0
0	0	0	1	0	4	4	0
0	0	0	0	0	0	0	0

8- Connectivity

First Pass: (6 Marks)

Union Label Tree: 1<-2 from yellow marked cell. (1 marks)

0	0	0	0	0	0	0	0
0	0	1	1	0	2	2	0
0	1	1	1	1	0	2	0
0	1	1	1	0	1	0	0
0	1	1	1	0	1	1	0
0	0	1	1	0	1	1	0
0	0	0	1	0	1	1	0
0	0	0	0	0	0	0	0

Second Pass: (3 Marks)
Replace 2 with 1, obtained from label tree.

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

12. (10 marks)

- Divide the intensity / luminance ranges to k uniformly distributed buckets for safe color space. (5 marks)
- Since for a grayscale image, luminance and intensities varies so move to HSI or Lab space with intensity or lumniance mapped with the bucket intensities (5 marks)

13. 1) Resample (5 marks) :

Full marks are awarded even in case of minor changes due to subjectivity.

		X	X	X	X	X	X		
	X						X		
	X						X		
	X						X	X	
	X							X	
	X							X	
		X		X	X		X		
			x			X			

2) Chain code (10 marks):

0->0->0->0->0->6->6->6->0->6->6->5->5->3->4->5->3->3->2->2->2->2->1

Full marks are awarded if anticlockwise traversal is done.

3) Concavities (5 marks):

Concavities : 2

If the explanation of 3 concavities is given then full marks are awarded. Otherwise partial marks are given according to the answer.