DIP - Assignment-2

Q1

Ans — we have.

r	P(r)	F(r)
0	0.21	0.25
1	0.21	0.50
2	0.25	0.75
3	0.25	1

we have
r → input image pixel values
P(r) → probability of r
F(r) → CDF of r

s	P(s)	F(s)
0	0.4375	0.4375
1	0.1875	0.625
2	0.125	0.75
3	0.25	1

we have
s → output image pixel values
P(s) → probability of s
F(s) → CDF of s

☒ Mapping r to s using F(r) & F(s)

r → s
0 → 0
1 → 0
2 → 2
3 → 3

Q2

Ans

$$I(x,y) = \begin{bmatrix} -1 & 2 & -1 \\ 3 & 0 & 1 \\ -2 & 1 & 2 \end{bmatrix}_{3\times 3}$$

$$w(x,y) = \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix}$$

filter after rotation.

$$w'(x,y) = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$$

Input after padding

$$\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ -1 & 2 & -1 \\ 3 & 0 & 1 \\ -2 & 1 & 2 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

Now in order to find output $g(x,y)$

Output image size = $(3+3-1, 3+1-1) = (5, 3)$
$= 5 \times 3$

$g(0,0) = 1\times0 + 0\times0 + -1\times-1$
$= 1$

$g(0,1) = 1\times0 + 0\times0 + -1\times2$
$= -2$

$g(0,2) = 1\times0 + 0\times0 + -1\times-1$
$= 1$

$g(1,0) = 1\times0 + -1\times0 + 3\times-1$
$= -3$

$g(1,1) = 1\times0 + 2\times0 + -1\times0$
$= 0$

$g(1,2) = 1\times0 + -1\times0 + 1\times1$
$= -1$

$g(2,0) = -1\times1 + 3\times0 + 1\times2$
$= 1$

$g(2,1) = 2\times1 + 0\times0 + -1\times2$
$= 1$

$g(2,2) = -1\times1 + 1\times0 + -1\times2$
$= -3$

$g(3,0) = 3\times1 + -2\times0 + -1\times0$
$= 0$

$g(3,1) = 1\times0 + 0\times1 + -1\times0$
$= 0$

$g(3,2) = 1\times1 + 2\times0 + -1\times0$
$= 1$

$g(4,0) = 1\times-2 + 1\times0 + -1\times0$
$= -2$

$g(4,1) = 1\times1 + 0\times1 + 0\times2$
$= 1$

$g(4,2) = 1\times2 + 0\times1 + 0\times1$
$= 2$

$$g(x,y) = \begin{bmatrix} 1 & -2 & 1 \\ -3 & 0 & -1 \\ 1 & 1 & -3 \\ 3 & 0 & 1 \\ -2 & 1 & 2 \end{bmatrix}$$

origin.