Experiment Name / No.: _____ Camlin Page No. Date / /

(a) Apply Weighted Average filter to the Pixel indicated by (*) using 3×3 neighborhood.

3	9	11	2
7	15*	8	8
10	12	9	10
1	9	11	2

1	2	1
2	4	2
1	2	1

$\Rightarrow (3\times1 + 2\times9 + 11\times1 + 7\times2 + 15\times4 + 8\times2 + 10\times1 + 12\times2 + 9\times1)/16$

$\Rightarrow$

(b) Show the result of zooming in the Image to double its size.

10	4	22
2	18	7
9	14	25

$3\times3 \xrightarrow{\text{double}} 6\times6$

Teacher's Signature: _____

Steps: (Nearest neighbor interpolation)

① Duplicate columns

② Duplicate Row

⇒

10	10	4	4	22	22
2	2	18	18	7	7
9	9	14	14	25	25

⇒

10	10	4	4	22	22
10	10	4	4	22	22
2	2	18	18	7	7
2	2	18	18	7	7
9	9	14	14	25	25
9	9	14	14	25	25

③ Scale this image by factor of two

100	50
70	20

add column b/w 2

⇒

100	75	50
70	45	20

$\Rightarrow \frac{100+50}{2} = 75$

$\Rightarrow \frac{70+20}{2} = 45$

Now add row b/w every 2 rows ⇒

100	75	50
85	60	35

Median filter

(2)

(9)

(8)	9	10	11	12
12	8	9	10	11
13	12	8	9	10
14	(12)	12	8	9
15	14	13	12	8

0 0 0 0 [0] 8 8 9 13

12 12 12 [13] 13 14 14 15

⇒ 8 → 0

⇒ 12 → 13

Mean → 8 → 0

13 → 8

Orthogonal Matrix → $A \cdot A^T = A^T \cdot A = I$ (Identity matrix)

(Square matrix)

$A^{-1} = A^T$ is valid for orthogonal matrix.

$$A = \frac{1}{3}\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ -2 & 2 & -1 \end{bmatrix}$$ find inverse.

$$A^T = \frac{1}{3}\begin{bmatrix} 1 & 2 & -2 \\ 2 & 1 & 2 \\ 2 & -2 & -1 \end{bmatrix}$$

$$A \cdot A^T \Rightarrow \frac{1}{9}\begin{bmatrix} 9 & 0 & 0 \\ 0 & 9 & 0 \\ 0 & 0 & 9 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Experiment Name / No.: _____ Camlin Page No. Date / /

Q] Obtain digital negative of the following 3×3 grey scale Image.

$f(x,y) =$

121	205	217
139	127	157
252	117	236

Linear Transform.

Grey scale 8 bit. so $n = 8$

$2^n = 2^8 = 256 \Rightarrow L$

Therefore $g(x,y) = L - 1 - f(x,y)$

(Transformed Image)

$\Rightarrow 256 - 1 - 121$

$g \Rightarrow$

134	50	38
116	128	98
3	138	19

Q] Given that Grey level is 0-7 ie. 8. Apply the following transformation—

→ Inversion
→ Square root
→ Square function
→ Logarithm function
→ Power

Teacher's Signature:

Given:

$f(x,y) =$

1	2	3	4
5	5	6	6
6	7	6	6
6	7	23	

$C = 1$

$\gamma = 1.2$

$a = 0.5$

Sol: ÷ Inversion

$$g(x,y) = L - 1 - f(x,y)$$

$$= 8 - f(x,y)$$

$$= 7$$

6	5	4	3
2	2	1	1
1	0	1	1
1	0	5	4

⇒ Square Root

$$g(x,y) = \sqrt{\underset{(L-1)}{7} \times f(x,y)}$$

2.6	3.7	4.5	5.2
5.9	5.9	6.4	6.4
6.4	7	6.4	6.4
6.4	7	3.7	4.5

⇒ Round off

3	4	5	5
6	6	6	6
6	7	6	6
6	7	4	5

(4)

→ Sq uare function $g(x,y) = [f(x,y)]^2$

$g(x,y) =$

1	4	9	16
25	25	36	36
36	49	36	36
36	49	4	9

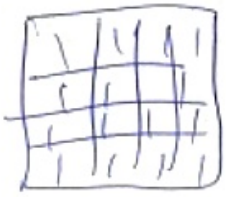
⇒ Intensity higher than 7 round off

1	4	7	7
7	7	7	7
7	7	7	7
7	7	4	9

→ Logarithm Function $g(x,y) = a \log [f(x,y)+1]$

$a = 0.5$ given.

⇒



⇒ Power - $g(x,y) = [c f^{\gamma}(x,y)]$

$c = 1$, $\gamma = 1.2$

⇓

1	2	4	5
7	7	9	9
9	10	9	9
9	10	2	4

⇒ Round off.