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Q.3 Given image :→

2	3	7	0	7
6	4	4	1	5
1	3	2	2	3
4	5	0	6	4
6	1	7	6	4

Step 1 :→ Applying 3×3 box filter to the pixel value 4 of box 1:

2	3	7
6	(4)	4
1	3	2

The pixel value '4' will be replaced by :-

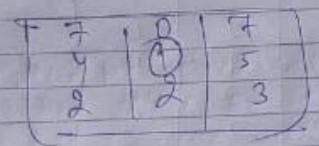
$\frac{1}{9}[2+3+7+6+4+4+1+3+2] = \frac{32}{9} = 3.5 \approx 4$

Step 2 :→ 3×3 box apply pixel value 4 of box 2.

3	7	0
4	(4)	2
3	2	2

$\frac{1}{9}[7+3+0+4+4+1+3+2+2] = 2.8 \approx 3$

Step 3: Applying 3×3 box pixel value 1:-

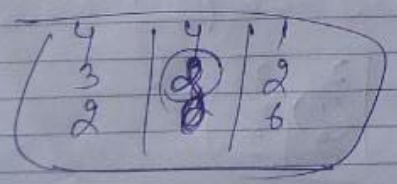


$\frac{1}{9}[7+0+7+4+1+5+2+2+3] = 3.4 \approx 3$

Step 4: Applying 3×3 box with pixel value 3:-

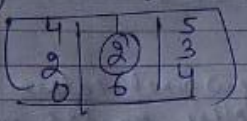
$\frac{1}{9}[6+4+4+1+3+2+4+5+0] = 3.2 \approx 3$

Step 5: Applying 3×3 filter pixel value 2:-



$\frac{1}{9}[4+4+1+3+2+2+2+0+6] = 3.3 \approx 3$

Step 6: Applying box 3×3 filter pixel value 2:-

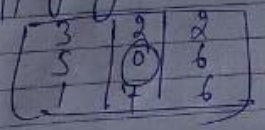


$\frac{1}{9}[4+1+5+2+2+3+0+6+7] = 3$

Step 7: Applying 3×3 box with pixel value 5:-

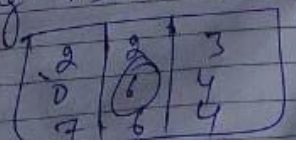
$\frac{1}{9}[1+3+2+4+5+0+6+1+7] = 3.2 \approx 3$

Step 8: Applying 3×3 box with pixel value 0:-



$\frac{1}{9}[3+2+2+5+0+6+1+7+6] = 3$

Step 9: Applying 3×3 box with pixel value 6:-



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$$\frac{1}{9}[2+2+3+6+0+4+7+6+4] = 3.7 \approx 4$$

∴ hence, the new pixel value after applying 3×3 box filter on 5×5 matrix of a 3 bit image will be

2	3	7	0	7
6	(4)	(4)	(1)	5
1	(3)	(2)	(2)	3
4	(5)	(0)	(6)	4
6	1	7	6	4

→

2	3	7	0	7
6	(4)	(3)	(3)	5
1	(3)	(3)	(3)	3
4	(3)	(4)	(4)	4
6	1	7	6	4