

Final 15/16 - 1st

Exercise 1: ~~~~~

1. c / 2. d / 3. a / 4.
5. a, d / 6. b / 7. d / 8. a

Exercise 2: ~~~~~

1. T / 2. F / 3. T / 4. F / 5. F / 6. F
7. T / 8. F / 9. F / 10. T / 11. F / 12. T

Exercise 3: ~~~~~

$a \rightarrow 3$	$b \rightarrow 6$	$c \rightarrow 1$
$d \rightarrow 2$	$e \rightarrow 5$	$g \rightarrow 4$

Exercise 4:

a)

Level	count	pdf	cdf	round((Level-1)*cdf)
0	34	0.00207	0.00207	0
1	50	0.00305	0.00512	0
2	500	0.03052	0.03564	0
3	1500	0.9155	0.12719	1
4	2700	0.16479	0.29198	2
5	4500	0.27465	0.56663	4
6	4000	0.24414	0.81077	6
7	3100	0.12921	1	7
Total	16384			

Level 0: 584

Level 1: 1500

Level 2: 2700

Level 3: 0

Level 4: 4500

Level 5: 0

Level 6: 4000

Level 7: 3100

b) it will remain the same

Exercise 5:

a)

13	0	13	6	8
0	0	4	7	9
14	0	7	3	12
0	9	9	6	1
8	5	15	11	4

-1	-2	-1
0	0	0
1	2	1

Horizontal

-1	0	1
-2	0	2
-1	0	1

Vertical

Horizontal: $(0 \times (-1)) + (4 \times (-2)) + \dots = 18$
 vertical: 10

Magnitude = $10 + 18 = 28$

b) 0 0 3 4 6 7 7 9 9

we replace 7 with 6

غير مطلوب (c)

```
def apply_median_filter(image, kernel_size):
    rows, cols = image.shape
    pad_width = kernel_size // 2

    padded_image = np.pad(image, pad_width, mode='edge')

    output_image = np.zeros_like(image)

    for i in range(rows):
        for j in range(cols):
            window = padded_image[i + pad_width : i + pad_width + kernel_size, j + pad_width : j + pad_width + kernel_size]
            median_value = np.median(window)
            output_image[i, j] = median_value

    return output_image
```

Exercise 6:

H.263 uses 4:2:1 subsampling, so 16 bits per pixel.

$$30 \text{ fps} \begin{cases} \rightarrow 2 \text{ I} \\ \rightarrow 14 \text{ P} \\ \rightarrow 14 \text{ B} \end{cases}$$

$$\text{Frame size} = 704 \times 576 \times 16 = 6\,488\,064 \text{ bits}$$

$$\hookrightarrow \left(2 \times \frac{16}{10} + 14 \times \frac{16}{20} + 14 \times \frac{16}{40} \right) \rightarrow \text{size for } \underline{1 \text{ sec}}$$

$\hookrightarrow 10:1$ $\hookrightarrow \text{twice as I}$ $\hookrightarrow \text{twice as P}$

$$2110080 \times 30 \times 60 = 4\,379\,440\,000 \text{ bits} \approx 5.098 \text{ GBytes}$$

Exercise 7:

// auto-magiem