Quiz 01

Attempts	Score
1/1000	12/12

Question 1

Image and video processing has applications in (you can select more than one correct answer.)

Answer

Outer-space images
Consumer images
Medical images

Explanation

The answer is all the above since, as we have seen in the introductory videos, image processing has applications in consumer images, medical images, outer-space images, and much more.

Question 2

Images exist only in the visual spectrum.

Answer

False

Explanation

The statement that images exist only in the visual spectrum is False, as we have seen in the early videos. Check video 3, Figure 1.5 (around 01:30) and the numerous examples provided there.

Question 3

When you enter dark room in a bright day, it takes some time before you can see reasonable well in the room. Which visual process explains this phenomena?

Answer

Brightness Adaptation

Explanation

Brightness adaptation is the visual process that explains that when you enter dark room in a bright day, it takes some time before you can see reasonable well in the room. Check Figure 2.4 in video 4 (around 04:30).

Question 4

Consider an image with 100 lines and 1000 pixels per line. Each pixel can take 256 different values. The total amount of bits needed to store that image is

Answer

800,000

Explanation

We have a total of 100x1000 pixels in the image, and we need 8 bits per pixel to represent 256 different values. The total number of bits is then 8x100x1000.
m = 100, n = 1000, k = log(256) = 8 (Base of log is 2).
So, bits required = m * n * k = 100 * 1000 * 8 = 800,000.

Question 5

Sampling refers to

Answer

Discretization of the spatial image domain.

Explanation

Sampling refers to discretization of the spatial image domain. See figures 2.16 (around 03:50) and 2.17 (around 07:17) in video 5.

Question 6

Quantization refers to

Answer

Discretization of the values an image pixel can take.

Explanation

Quantization refers to discretization of the values an image pixel can take. See figures 2.16 (around 03:50) and 2.17 (around 07:17) in video 5.

Question 7

Going from a pixel with coordinate (1,1) to a pixel with coordinate (0,0) takes

Answer

One step for 8 adjacency and 2 steps for 4 adjacency.

Explanation

While with 8 adjacency we can travel diagonally (and then a single step), for 4 adjacency we can only move down and then left (a total of 2 steps).

Question 8

The determinant of a scaling matrix is equal to 1.

Answer

False

Explanation

False. The determinant actually represents the scale, see Table 2.2 (around 11:42) in video 6.
Determinant of scaling matrix = s(x) * s(y), where s(x) & s(y) are the scaling factors in the x and y directions, respectively.

Question 9

The determinant of a rotation matrix is

Answer

1

Explanation

The determinant of a rotation matrix is equal to 1, see Table 2.2 (around 11:42) in video 6 as well as the excellent and very detailed forum discussion on this question.
Determinant of a rotation matrix = (cos(theta))^2 + (sin(theta))^2 = 1.

Question 10

When we quantize an image, the amount of memory needed to store it

Answer

Decreases.

Explanation

It decreases. As we will see later, quantization is critical for compression, reducing the amount of storage needed while maintaining important visual characteristics.

Question 11

A video has 30 frames (images) per second. Considering that each image has 1000 * 1000 pixels, an hour of video will occupy

Answer

We can't know.

Explanation

We can't know because the number of gray levels per pixel was not specified.

Question 12

If we quantize an image with double resolution (meaning we use twice the number of bits per pixel) and sample it with half the resolution in each direction, then

Answer

The total storage needed is reduced by half.

Explanation

Since we are reducing the resolution by 2 in each direction, the total number of pixels is reduced by 4. At the same time we are doubling the number of bits per pixel and therefore the total storage is only reduced by 2.
m(new) = m(old) / 2, n(new) = n(old) / 2 and k(new) = k(old) * 2.
So, new space required = old space required / 2.