Started on	Monday, 25 April 2022, 9:12 AM
State	Finished
Completed on	Monday, 25 April 2022, 9:32 AM
Time taken	19 mins 54 secs
Grade	**5.75** out of 10.00 (**58**%)

Question **1**

Incorrect

Mark 0.00 out of 2.00

You are willing to stream audio content (music) via a digital channel *without compression* in real time. For this you need an internet channel bandwidth **B**, which will satisfy your condition.

1) You know, that music you are streaming consists of voices and instruments with the highest possible harmonic of **F** = 3 **kHz.** This means you are sure there are no frequencies bigger than *F* in spectral representation.

2) You compute optimal sample (discretization) frequency **S** based on Nyquist-Shannon theorem.

3) You need to deal with signal quantization, thus you decide that having **64K** levels is enough to represent your signal with almost no loss. You choose integer data type of **Q** bytes which can fit this number of quantization levels.

4) You record your sound using **X** = 4 microphones. You need all of them to be passed through your channel.

What is the minimum possible **Bytes Per Second** bandwidth **B** of your internet channel enough to stream this audio with no compression?

Answer: 144 ✖

From (2) S = 2F kHz = 2000 * F Hz.

From (3) 64K fits into Q=2-byte integer type.

Alltogether BPS = S * Q * X = 2000 * F * Q * X = 4000 * F*X.

The correct answer is: 48000

Question **2**

Correct

Mark 1.00 out of 1.00

Which one of the following techniques is the best suitable to retrieve all views of Formula One car from video during the race given a single shot of a car?

- a. SIFT ✔
- b. wavelet hash
- c. convolutional autoencoder
- d. Haralick features
- e. Xerox features

Your answer is correct.

The correct answer is:
SIFT

Question **3**

Correct

Mark 1.00 out of 1.00

We know that human's ear has upper limit in perception of frequencies, say, 20 kHz.

We know that Nyquist-Shannon theorem guarantees that all frequencies up to **F** are exactly restored for **2F** sampling rate.

We know, that in the air **there is a source of sound** with a frequency higher than 20 kHz.

Imagine we sample at 40 kHz for recording.

Which statement is true?

- a. We will have a quality loss in low frequencies recoding.
- b. We will have a quality loss in high frequencies recoding.
- c. Restored signal is exactly the same for human's ear.
- d. Low frequency noise can appear while playing the recording. ✔

Your answer is correct.

Please refer to https://en.wikipedia.org/wiki/Aliasing#Online_audio_example

The correct answer is:
Low frequency noise can appear while playing the recording.

Question **4**

Correct

Mark 1.00 out of 1.00

Your sound search algorithm shows the best performance when used together with the method of Dynamic Time Warping, but fails without. Please choose **all** correct statements about your query data:

- a. original query is an exact sample from our database
- b. this is professor Protasov singing "Sick love" song by RHCP ✔ this can be the case, as I'm not exactly matching with tempo
- c. input query audio may be a 1.1x speed of my database samples ✔ yes, DTW can fix this issue
- d. the sound has additive Gaussian noise
- e. this is because we query the text pronounced by a human

Your answer is correct.

The correct answers are:
input query audio may be a 1.1x speed of my database samples,

this is professor Protasov singing "Sick love" song by RHCP

Question **5**

Partially correct

Mark 0.50 out of 1.00

Original Shazam algorithm in the very end cares about the following values (choose all relevant):

- a. Relative time between 2 frequency peaks ✔
- b. Exact frequency values
- c. Discretised frequency values (frequency bins)
- d. Absolute time of frequency peaks
- e. Relative frequency values (frequency ratio)

Your answer is partially correct.

You have correctly selected 1.
The correct answers are:
Discretised frequency values (frequency bins),

Relative time between 2 frequency peaks

Question 6

Partially correct

Mark 0.25 out of 1.00

Which features can a human vision (or a digital camera with Bayer filter) recognise?

- [x] a. 3-dimensional color intensity vector, corresponding to a frequency ✔ Yes, this is what our cone cells can actually do
- [ ] b. polarisation
- [ ] c. distance from focus
- [x] d. Distance to the source of the reflected light (via phase) ✖ No, light-field cameras use this property, but not humans
- [ ] e. absolute frequency value

Your answer is partially correct.

You have correctly selected 1.
The correct answers are:
3-dimensional color intensity vector, corresponding to a frequency,

distance from focus

Question 7

Correct

Mark 1.00 out of 1.00

Which features will you rely on if you want to narrow your search to drawings only?

- ( ) a. CBIR
- ( ) b. HTML
- ( ) c. SIFT
- ( ) d. EXIF
- (•) e. GLCM ✔

Your answer is correct.

The correct answer is:
GLCM

Question 8

Incorrect

Mark 0.00 out of 1.00

Define an image duplicate

a. image of the same object

b. image taken by the same camera in the next moment of time with minimal latency

c. image prepared from the same source image with minimal aberrations

d. image taken at the same moment of time with different camera

e. image of the same object from the same point ✖

Your answer is incorrect.

The correct answer is:
image prepared from the same source image with minimal aberrations

Question 9

Correct

Mark 1.00 out of 1.00

What is the color of the dress according to professor?

a. red and yellow

b. blue and black

c. white and golden ✔

Your answer is correct.

The correct answer is:
white and golden