

University of Msila
Faculty of Mathematics and Computer Science
Department of Computer Science

Semestrial Exam
Speciality : Master 1 RTIC

QoS and Multimedia (Duration : 1h30m)

14 January 2024

Course Question (06 pts)

1. Can the process of converting a color image to grayscale be reversed?
Please provide an explanation for your response. **(1,5pt)**.
2. What is the sample rate? and what is the impact on audio quality when an audio file is downsampled from 44 kHz to 8 kHz? **(1,5pt)**.
3. Two lossless compression algorithms - A_1 and A_2 - will be applied on a Source S. How can you choose the best algorithm between them?. **(1,5pt)**.
4. List three image formats. **(1,5pt)**.

Exercice 1 (09 pts)

Consider the image I of size 7×7 , encoded with 3 bits:

1	1	3	6	1	6	6
3	1	1	1	7	5	5
3	1	1	1	1	3	3
3	1	1	5	5	7	7
1	1	1	5	5	1	1
5	7	1	3	5	6	1
6	3	6	3	7	6	7

I

1. Calculate the size of image I in pixels and then in bits. **(0,5pt)**.
2. Explain with an algorithm how one can calculate the histogram H from I . **(1,5pt)**.

3. Represent the histogram of I .(1pt).

We are foccusing to compress I . Based on the histogram:

4. Calculate the Entropy of I .(1pt).

5. Apply Shannon-Fano coding (1,5pt) , and Huffman coding (1,5pt) on I .

6. Calculate the Average codeword length of these two compressions.(1pt).

7. Based on the efficiency, Decide what is the best of them we will use for I . (1pt).

Exercise 2 (05 pts)

Let R , G , and B be the three color components of the image I_c . R , G , and B are encoded on 8 bits each.

255	0	255	0	255
0	0	255	255	255
0	255	255	0	255
255	0	255	255	255
0	0	255	255	255

R

0	0	255	0	255
255	0	0	255	0
0	255	255	0	255
0	0	255	255	0
255	255	255	255	255

G

0	0	255	255	255
0	255	255	0	255
255	0	255	0	255
255	0	0	0	255
255	0	255	0	255

B

1. Give, in bytes, the size of the image I_c .(1pt).

we want to Convert I_c Color image to a 3-bit Color Indexed Image J using the look-up table LUT :

2. Explain with an algorithm how one can implement this conversion. (2pt).

3. Represent the image J .(1pt).

4. Calculate the size of J in bytes -LUT should be calculated also -(1pt).

Index	R	G	B
0	0	0	0
1	0	0	255
2	0	255	0
3	0	255	255
4	255	0	0
5	255	0	255
6	255	255	0
7	255	255	255

3-bit Color Indexed
Image Look-Up Table
(LUT)

Good Luck