University of Ruhuna - Faculty of Technology
Bachelor of Information & Communication Technology Honours Degree
Level 1 (Semester I) Examination, June/July 2023
Academic Year 2021/2022
Course Unit: ICT1122 – Introduction to Multimedia Technologies (Written)

Answer **all three (03)** questions   **Time Allowed: 1 $^{1}/_{2}$ hours**

IMPORTANT INSTRUCTIONS

- This paper contains **three (03)** questions on five (05) pages.
- The medium of this examination is **English.**
- This is a **closed book** examination.
- Each question carries **equal 100** marks.
- You are allowed to use non-programmable calculators in this examination.

Question 01

a) Multimedia is an integration of continuous media and discrete media through which digital information can be conveyed to the user in an appropriate way.

[24 marks]

i) Briefly describe what is interactive multimedia.

ii) Distinguish **two (02)** differences between vector fonts and bitmap fonts.

iii) List down **two (02)** types of character sets except for Unicode.

iv) State **three (03)** characteristics of the Unicode character set.

b) A digital image is a representation of a two-dimensional image as a finite set of digital values called picture elements or pixels.

[24 marks]

i) Briefly discuss what is an image bit depth.

ii) Determine the bit depth of a true color image.

iii) Total image capacity of true color image is 1200000 bytes and image width is 800 pixels. Calculate the height of the image in pixels.

iv) Briefly explain the process of rasterization in an image.

c) Run-length encoding is probably the simplest method of compression. Apply the Run-length encoding algorithm to the following given image (Figure 01). Assume that one pixel of the image represents one byte and calculate the total bytes of uncompressed image and compressed image.
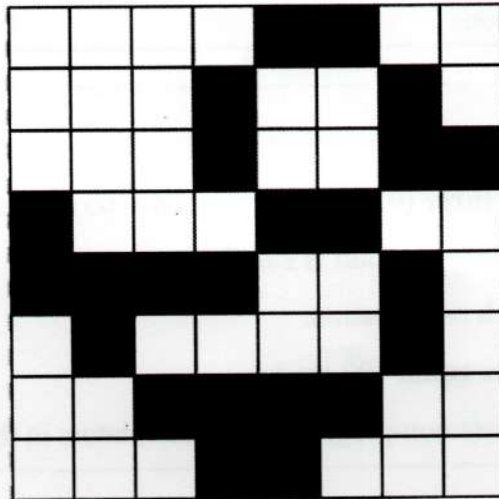
[12 marks]

Figure 01

d) A sound is a pattern of atmospheric pressure variations occurring over time.

[40 marks]

i) What do you mean by "Waveform" and "Amplitude" of an audio signal?

ii) Distinguish **three (03)** differences between analog and digital audio signals.

iii) Briefly discuss the process of sampling of a signal with the aid of suitable graphs.

iv) The details which are given below are relevant for audio recording. Calculate the sampling rate of the audio signal by using them.

- Size of the audio recording: 1920 Kilobytes
- Bit resolution: 16 bits per sample
- Number of channels: 2
- Time (Duration): 4 minutes

Question 02

a) Video is an excellent tool for delivering multimedia. It places the highest performance demand on the computer and its memory and storage.

[42 marks]

    i)   Video signals can be categorized into **three (03)** different categories. List them down and briefly explain **two (02)** of them.

    ii)   Examine Figure 02 below and identify the categories A, B and C correctly mentioned in the above part (i).

Figure 02

    iii)   State **three (03)** broadcast video standards.

    iv)   Duration of a PAL video is 12 minutes andhas a frame rate of 30 frames per second. Calculate the total number of frames in this video.

    v)   "Non-Linear editing is more flexible than linear editing". Do you agree with this statement? Justify your answer by providing **two (02)** reasons.

b) MPEG algorithms compress the data to form small bits that can be easily transmitted and then decompressed accurately and quickly to allow high-fidelity reconstruction.

[12 marks]

   i)   Write down the steps of the MPEG Compression Process.

   ii)   What do you mean by Intraframe and Interframe compression in a video file?

c) Animation is telling a story through motion or giving the impression that the characters are moving.

[26 marks]

   i)   Animation is possible because of a biological phenomenon known as the persistence of vision. Briefly describe the process of persistence of vision.

   ii)   Briefly explain the terms "keyframing" and "Morphing."

   iii)   List down **three (03)** stages which are involved in life cycle of an 3D animation and briefly discuss them.

d) Consider the following given real world scenarios. They are examples of different animation principles. Identify the relevant animation principle according to the given scenario and provide a suitable justification for each of your answers.

[20 marks]

   i)   A cat is running and suddenly turns, then its tail might whip around.

   ii)   A dancer bending down before leaping into the air.

   iii)   A student is typing hard on the keyboard while wiping his forehead.

   iv)   A shy child would turn their eyes down, and slightly rotate their upper body away for the gaze of another child.

   v)   A falling rubber ball may begin to stretch as it speeds up.

Question 03

a) Data compression is a reduction in the number of bits needed to represent data. It can save storage capacity, speed up file transfer, and decrease storage hardware and network costs.

[18 marks]

   i) Briefly discuss the data compression and decompression process using a suitable diagram.

   ii) Distinguish the main difference between the lossless and lossy compression methods.

b) Consider the following given dataset and apply Lempel Ziv encoding algorithm to obtain the following requirements.

[34 marks]

   AABBBABBAABBBAAA

   i) Build an index dictionary using the above given dataset and obtain the compressed data by using it.

   ii) Assume that both the sender and the receiver have a copy of the dictionary. Decompress the following given compressed data to obtain the original data in reciever's end.

   4B1A3AA7AB2AB1BB

c) Assume that you are given a data file with only five symbols (K, L, M, N, O). The relevant frequencies of each symbol are given below in Table 01.

[48 marks]

Symbol	K	L	M	N	O
Frequency	25	8	15	10	35

Table 01

   i) Draw a Huffman tree to assign bit pattern to each symbol using Huffman Encoding.

   ii) Assign bit pattern to each symbol.

   iii) Encode the text given below using bit pattern which you derived from part (ii) and create a Huffman code for it.

   OKOMKNLOK

---------------------------- **End of the Paper**----------------------------