Inspiring Innovation and Leadership

KARATINA UNIVERSITY

UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER EXAMINATIC

FOR THE DEGREE OF

BACHELOR OF SCIENCE IN COMPUTER SCIENCE,
BACHELOR OF SCIENCE IN INFORMATION

COURSE CODE: COM 429

COURSE TITLE: MULTIMEDIA TECHNOLOGIES

DATE: 25TH APRIL, 2024 **TIME: 3:00 – 5:00PM**

INSTRUCTION TO CANDIDATES

- SEE INSIDE

Instructions: Answer ALL Questions in SECTION A and ANY TWO in SECTION B

QUESTION ONE (1) is COMPULSORY (Carries 30 Marks)

SECTION A

QUESTION 1: (COMPULSORY) 30 MARKS

a) Giving relevant examples in each case differentiate between the following terms as used in multimedia applications (4marks)
   i. Hypertext and Hypermedia
   ii. Scene graphs and scene nodes

b) An image of size (640×480) pixels, how many KB are required to store this image in two cases: (4 marks)
   i. Binary image
   ii. Grayscale image

c) "Millano Jeans", a famous jeans company would like to add an animated advertisement banner on the Web for a jeans show. The Vice President of the company is concerned about the quality of the graphics and animation design. As the project manager, you are required to write a technical report that describes the technical design issues for such projects.
Required:

   i. Highlight the key issues multimedia systems need to deal with that you will include in the report (4 marks)

   ii. List and explain any four desirable features in multimedia systems that you will include in the report as the possible solution for the issues in (i) above (4 marks)

d) Give an application in which CMYK colour model is mostly used and explain the reason. (2 marks)

e) Distinguish between lossless and lossy data compression (2 marks)

f) Explain three characteristics of multimedia data that influence data placement techniques (3 marks)

g) Using Dictionary-Based Coding (LZW) compress the following string "ABABBABCABABBA". Initially the dictionary is as shown below

(4 marks)

Code	String
1	A
2	B
3	C

h) Write a VRML program that renders two spheres on the screen. The first sphere should have emissive red color and should default to the centre of the scene. The second sphere should have emissive blue color and translate at 2.25 0 0 along the positive X axis in the same scene. (3 marks)

QUESTION TWO: 20 MARKS

a) Compression is possible because most real-world data have statistical redundancy. In line with the statement discuss five types of redundancy giving relevant multimedia data that can be exploited in each type (5 marks)

b) Nyamachaki primary school has requested you to develop an application that displays a motion of planets to be used during science class lessons. State and explain the most appropriate authoring metaphor(s) you will use to develop the application (3 marks)

c) Explain any two considerations necessary in deciding how to digitize audio data. (2 marks)

d) MIDI is a protocol that enables computer, synthesizers, keyboards, and other musical or (even) multimedia devices to communicate with each other. How is a basic MIDI message structured? (3 marks)

e) Write a VRML program which, when parsed by a VRML browser, will display a VRML world containing a blue sphere. (2 marks)

f) Using an example of your choice, demonstrate how Run Length Encoding (RLE) is used in compressing graphic type images. (5 Marks)

QUESTION THREE (20 MARKS)

a) Distinguish between the following;
   i. Entropy encoding and Source encoding. (2 marks)
   ii. Differential encoding and Transform encoding. (2 marks)

b) Karatina University innovation club has selected you to be in a team that has been tasked with the development of a multimedia system that will have various applications in the university. Describe **THREE** challenges the team is likely to face in in the process of carrying out its mandate. (5 marks)

c) Sampling involves measuring the quantities of an analogue signal that we are interested in at evenly space intervals.

i. Differentiate between the terms Sampling and Quantization. (2 marks)

ii. Using well labelled diagrams, differentiate between sampling an analogue signal in time dimension and amplitude dimensions (4 marks)

iii. Using a sinewave, explain the Nyquist theorem as used in digital sound sampling (3 marks)

iv. Explain the term Aliasing and briefly discuss one effect of aliasing. (2 marks)

QUESTION FOUR (20 MARKS)

a) Explain four basic characteristics of multimedia systems (4 marks).

b) Explain using RAID levels the following techniques as used in Redundant Array of Inexpensive Disks (RAID): Striping, mirroring and parity. (6 marks)

c) Provide a binary coding tree describing the process of encoding a single word "HELLO" using the Huffman algorithm. (5 Marks)

d) Discuss any FIVE Multimedia application classes/areas other than game systems. (5 marks)

QUESTION FIVE (20 MARKS)

a) Elaborate any THREE sound formats as used in Multimedia Systems. (3 Marks)

b) Analyze the three basic components of a VRML file. (3 Marks)

c) Differentiate between the two types of compression categories in Multimedia Systems. (4 Marks)

d) Explain the steps of producing a Multimedia application. (6 Marks)

e) Write a VRML program that renders two spheres on the screen. The first sphere should have emissive red color and should default to the center of the scene. The second sphere should have emissive blue color and translate at 2.25 0 0 along the positive X axis in the same scene. (4 Marks)