



MACHAKOS UNIVERSITY

University Examinations for 2021/2022

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY
FOURTH YEAR SECOND SEMESTER EXAMINATION FOR
BACHELOR OF SCIENCE (COMPUTER SCIENCE)
SCO 405: COMPRESSION TECHNIQUES

DATE: 7/12/2021

TIME: 8.30-10.30 AM

INSTRUCTION

Answer question **ONE** and Any other **Two** among the four selective questions

QUESTION ONE (COMPULSORY 30 MARKS)

- a) Explain the importance of data compression for Multimedia activities (6 marks)
- b) Explain why lossy or lossless compression techniques cannot replace each other (6 marks)
- c) Given the token **AAABDCEFBBAADCDF**, fill the table below (9 marks)

Compression algorithm	Compression ratio	Compression factor	Saving Percentage
Pattern substitution			
Run length			
Zero Length			

- d) Explain why Huffman algorithm is also called greedy algorithm (5 marks)
- e) Discuss two main issues in arithmetic coding (4 marks)

QUESTION TWO (20 MARKS)

- a) List four criteria used in measuring the performance of a compression algorithm (4 marks)
- b) Using the message ABBABBCDABCBABCD,
 - i. Write the encoded string using LZW algorithm (6 marks)
 - ii. Using the dictionary developed in (i) above, explain LZW decoding algorithm (4 marks)
- c) Explain the best compression techniques for each of the following
 - i. Text (2 marks)
 - ii. Image (2 marks)
 - iii. Sound data (2 marks)

QUESTION THREE (20 MARKS)

- a) Differentiate the following
 - i. Quantisation and entropy (2 marks)
 - ii. Distortion-rate problem and Rate-distortion problem (2 marks)
- b) Describe transform based coding using 2X2 matrix (5 marks)
- c) A student composed a message, **HI,HALLO KHUMALOOH**, and transmitted it over the internet.
 - i. Calculate the entropy (5 marks)
 - ii. Write the encoded message using arithmetic coding given the sequence **H A M** (6 marks)

QUESTION FOUR (20 MARKS)

- a) Explain the challenges with compression of multimedia files (5 marks)
- b) A networking company uses a compression technique to encode the message before transmitting it over the network. Suppose the message contains the following characters **ABECADBC**, answer the following question
 - (i) Write the number of bits transmitted if the message is compressed using Huffman coding (7 marks)
 - (ii) Using the tree in (i) above, decode the cipher text 010001011 and write the message (2 marks)
- c) Explain how the knowledge of compression techniques can be applied by the following professionals
 - i. Video producer (2 marks)
 - ii. Big data analysis (2 marks)
 - iii. Online content developer (2 marks)

QUESTION FIVE (20 MARKS)

- a) Briefly explain how each type of frame, by the group of pictures in H.261 and MPEG, achieves some form of video compression. (6 marks)
- b) Briefly outline the MPEG-4 structured audio standard tools. (6 marks)
- c) Describe DCT (5 marks)
- d) List three compression software for video (3 marks)