



MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

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: 19/10/2020

TIME: 8.30-10.30 AM

INSTRUCTIONS

Answer question ONE and any other TWO questions.

QUESTION ONE (30 MARKS) (COMPULSORY)

- a) Discuss Two Main issues in arithmetic coding (5 marks)
- b) Write a running program to implement LZW algorithm (8 marks)
- c) A student tossed a fair die six times. Find the entropy (4 marks)
- d) Explain any three key differences between the JPEG and MPEG I-Frame compression pipeline (6 marks)
- e) Encode the message AAAABBBBAABBBBBCCCCCCCCDABCBAABBBBCCD using
 - i. Pattern Substitution (3 marks)
 - ii. Shano-Fannon Encoding (4 marks)

QUESTION TWO (20 MARKS)

- a) A networking company uses a compression technique to encode the message before transmitting over the network. Suppose the message contains the following characters ABECADBC, answer the following questions that follows
 - i. Find the total number of bits transmitted without compression using ASCII (2 marks)
 - ii. Calculate the number of bits transmitted if the message is transmitted using Huffman coding (7 marks)

- iii. Calculate the compression ratio, factor and saving percentage (Original is i and compressed is ii above) (3 marks)
- iv. Using the table in ii above, decode the cipher text 010001011 (2 marks)
- b) Explain the common techniques for predicting motion in videos (6 marks)

QUESTION THREE (20 MARKS)

- a) Discuss the application of compression in the following areas (6 marks)
 - i. Generic file compression
 - ii. Multimedia.
 - iii. Communication.
- b) Transmit the data {250, 251, 251, 252, 253, 253, 254, 255} through a bandwidth of 16 bits using lossy compression. (6 marks)
- c) A student was given the following table.

Symbols	Probability
0	0.63
2	0.11
14	0.1
136	0.1
222	0.06

- i. Given the input sequence 2 0 0 136 0, encode the message below using arithmetic coding (6 marks)
- ii. Find the input sequence for the coded message 0.657 (2 marks)

QUESTION FOUR (20 MARKS)

- a) Given the following frames, find the encoded message (5 marks)

5 7 6 2 8 6 6 3 5 6
6 5 7 5 5 6 3 2 4 7
8 4 6 8 5 6 4 8 8 5
5 1 2 9 8 6 5 5 6 6
5 5 2 9 9 6 8 9 5 1

First frame

5 7 6 2 8 6 6 3 5 6
6 5 7 6 5 6 3 2 3 7
8 4 6 8 5 6 4 8 8 5
5 1 3 9 8 6 5 5 7 6
5 5 2 9 9 6 8 9 5 1

Second frame

5 7 6 2 8 6 6 3 5 6
6 5 8 6 5 6 3 3 3 7
8 4 6 8 5 6 4 8 8 5
5 1 3 9 7 6 5 5 8 6
5 5 2 9 9 6 8 9 5 1

Third frame

- i. Between first and second frame
- ii. Between second and third frame
- b) Discuss three objectives of compression (6 marks)

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|-----|----|----|-----|
| 128 | 32 | 64 | 160 |
| 32 | 16 | 12 | 32 |
| 128 | 64 | 46 | 128 |
| 4 | 31 | 40 | 32 |

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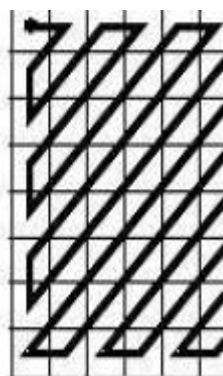
- ### QUESTION FIVE (20 MARKS)

- 0000000000000000000000000000000011111111111000000000

000000000000000000000000000000001111111111

0000000000000000000000001111111111111111

The diagram shows a 10x10 grid of squares on the left. An arrow points to the right, where a single column of 10 squares is shown. This represents the transformation of a 2D space into a 1D space, which is a key concept in understanding vector spaces and linear transformations.



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