MACHAKOS UNIVERSITY

University Examinations for 2017/2018

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR BACHELOR OF COMPUTER SCIENCE

SCO 405: COMPRESSION TECHNIQUES

DATE: 13/12/2017 **TIME: 2.00-4.00 PM**

INSTRUCTIONS

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

QUESTION ONE (30 MARKS) (COMPULSORY)

a) Differentiate between lossy and lossless data compression (4 marks)

b) Define entropy and calculate the average entropy for the message: **HELLO WORLD!** (8 marks)

c) Encode the message below using Huffman coding: "AAABDCEFBBAADCDF" (10 marks)

d) Discuss four frame types with different temporal correlations found in mpeg (8 marks)

QUESTION TWO (20 MARKS)

a) Discuss fractal compression (7 marks)

b) State three fundamental steps of DPCM (3 marks)

c) Given the following Differential Pulse Code Modulated (DPCM) Sequence reconstruct the original signal. +4 + 2 + 3 - 2 + 3 - 1 + 1 + 1 (4 marks)

d) A source image file with 65,536 bytes is compressed into a file with 16,384 bytes. Calculate

i. Compression ratio (2 marks)

ii. Compression factor (2 marks)

iii. Saving percentage (2 marks)

QUESTION THREE (20 MARKS)

a) Encode the message AAAABBBAABBBBBCCCCCCCCDABCBAABBBBCCD using

i Pattern Substitution (3 marks)

ii Run Length Encoding (fixed and variable) (4 marks)

iii Shano-Fannon Encoding (3 marks)

b) Briefly outline, with the aid of suitable diagrams, the JPEG/MPEG I-Frame compression pipeline and list the constituent compression algorithms employed at each stage in the pipeline. (10 marks)

QUESTION FOUR (20 MARKS)

a) Describe LZW coding algorithm (4 marks)

b) Given that Alphabet: X = {A, B, C} and Message:ABABCBABAB, encode the message using the LZW algorithm (4 marks)

c) Explain any three reasons why data compression is needed in real life (6 marks)

d) Explain three kinds of motion prediction techniques in video compression (6 marks)

QUESTION FIVE (20 MARKS)

a) Define JPEG and State four modes of compression with JPEG (6 marks)

b) Briefly outline the MPEG-4 structured audio standard. (8 marks)

c) Using the table below, encode the message below using arithmetic coding (6 marks)

Symbol, x	**Probability, N[x]**
A	0.2
B	0.3
C	0.5