FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

SCHOOL OF INFORMATION AND COMMUNICATION TECHNOLOGY

DEPARTMENT OF INFORMATION AND MEDIA TECHNOLOGY

FIRST SEMESTER 2018/2019 EXAMINATION

COURSE CODE:	CIT413
COURSE TITLE:	DATA COMPRESSION
CREDIT UNITS:	2
TIME ALLOWED:	**2HRS**
COURSE LECTURER(S):	MRS. F.J. BABAKANO
NUMBER OF QUESTIONS:	5
NUMBER OF PAGES:	3 (INCLUDING THIS PAGE)

INSTRUCTIONS

- Answer Question ONE and ANY OTHER TWO questions
- Do **not** use red pen
- Please use a clear handwriting
- This exam is closed book, closed notes, closed laptop and closed cell phone
- Please use non-programmable calculators only

1. a. What is data compression and why do we compress data? (3mrks)

b. Explain briefly the meanings of *lossless* compression and *lossy* compression. For each type of compression, give an example of an application, explaining why it is appropriate. (3 mrks)

c. Differentiate between Static dictionary and Dynamic dictionary (2mrks)

d. Outline the main compression approaches and which class does Huffman coding belongs to? (10 mrks)

e. How do you measure the efficiency (performance) of a data compression algorithm? (6 mrks)

f. Draw the Huffman tree and table for symbols shown in table below. Use the table to encode the word "nigerian". (6 mrks)

Symbol	e	a	g	n	r	i
frequency	1	1	1	2	1	2

2. a. Compare and contrast between arithmetic encoding and Huffman encoding. (6mrks)

b. Determine whether the following codes for {A, B, C, D} are *uniquely decodable*. Give your reasons for each case.

(i) {0, 10, 101, 0101}

(ii) {000, 001, 010, 011}

(iii) {00, 010, 011, 1}

(iv) {0, 001, 10, and 010} (4 mrks)

c. Explain with a diagram the two types of buffers in the LZ77 compression algorithm implementation. (5 mrks)

3. a. Explain Run-length algorithm and explain under what conditions a Run-length algorithm may work effectively? (5mrks)

b. Encode and decode "abbcaac" using arithmetic encoding given the distribution table below: (10 mrks)

Probability Distribution

Symbol	Probability	Symbol Interval
a	2	[0.0 , 0.5)
b	1	[0.5 , 0.75)
c	1	[0.75 , 1.0)

4. a. Draw adaptive Huffman binary tree for "constitutions". (10 mrks)

b. Differentiate between dictionary based compression and statistical based compressions (5mrks)

5. a. Given seven symbols with probabilities .02, .03, .04, .04, .12, .26, and .49, construct binary Huffman code-trees for them. (5mrks)

b. Describe briefly how each of the two classes of lossless compression algorithms, namely the *adaptive* and the *non-adaptive*, works in its model. (5mrks)

c. Explain with a diagram the two types of buffers in the LZ77 compression algorithm implementation. (5mrks)