UNIVERSITY OF AGRICULTURE ABEOKUTA
COLLEGE OF NATURAL SCIENCES
DEPARTMENT OF COMPUTER SCIENCE
FIRST SEMESTER EXAMINATION (2009/2010 SESSION)
COURSE TITLE: DATA STRUCTURE AND ALGORITHMS
COURSE CODE: CSC 313   UNIT: 3   TIME ALLOWED: $2^{1}/_{2}$ HOURS

INSTRUCTION: Answer FOUR questions, two questions from each section.

SECTION A

1(a) Find the following floor and ceiling numbers:

(i) $\lfloor \sqrt[3]{30} \rfloor$ (ii) $\lfloor -7.5 \rfloor$ (iii) $\lfloor -18 \rfloor$ (iv) $\lfloor \sqrt{30} \rfloor$ (v) $\lceil \pi \rceil$ (vi) $\lceil -7.5 \rceil$ (vii) $\lceil -9 \rceil$ (viii) $\lfloor 9 \rfloor$

(8 marks)

(b) Consider the company, whose each of his employees is assigned a 4-digit employee number which is used as the primary key in the company's employee file. Supposed L consists of 100 two-digit addresses: 00, 01, 02, ... , 99. Find the 2-digit hash address of each number 6713, 4409 and 1825 using (i) the division method, with m = 97; (ii) the mid-square method;   (iii) the folding method without reversing (iv) the folding method with reversing

(12 marks)

2 (a) Consider the linear arrays XXX(-10:10), YYY(1935:1985), ZZZ(35).
(i) Find the number of elements in each array.
(ii) Suppose Base(YYY) = 400 and w = 4 words per memory cell for YYY. Find the address of YYY[1942], YYY[1977] and YYY[1988].

(12 m.)

(b) Write an algorithm to transverse a linear array

(8 m.)

3 (a) Figure (1) is a list of five hospital patients and their room numbers.
(i) Fill in values for NSTART and NLINK so that they form an alphabetical listing of the names.
(ii) Fill in values for RSTART and RLINK so that they form an ordering of the room numbers.

NSTART
[ ]

RSTART
[ ]

	NAME	ROOM	NLINK	RLINK
1	Brown	650		
2	Smith	422		
3	Adams	704		
4	Jones	462		
5	Burns	632		

Figure (1)

(12marks)

(b) Write an algorithm to finds the location of the node where an item first appears in a linked list.

(8 marks)

SECTION B

4 (a) Insert these nodes number 9, 13, 17, 2, 5, 15, 18, 12 and 19 using extract
maximum of heap method. (10 marks)

(b) The encrypted version of a message LJMKGM   GMXF   QEXMW, if it was
encrypted using the function

$$f(p) = (7p + 10) \bmod 26,$$

what was the original message? (10 marks)

5 (a) Write Huffman's algorithm (10 marks)

(b) What is an optimal Huffman code for the following set of frequencies based on the
first eight (8) Fibonacci numbers:
a:1,   b:1,   c:2,   d:3,   e:5,   f:8,   g:13,   h:21 (10 marks)

6 Use both Prim's and Kruskal's algorithms to find a minimum spanning tree for the weighted graph in figur
(20 marks)
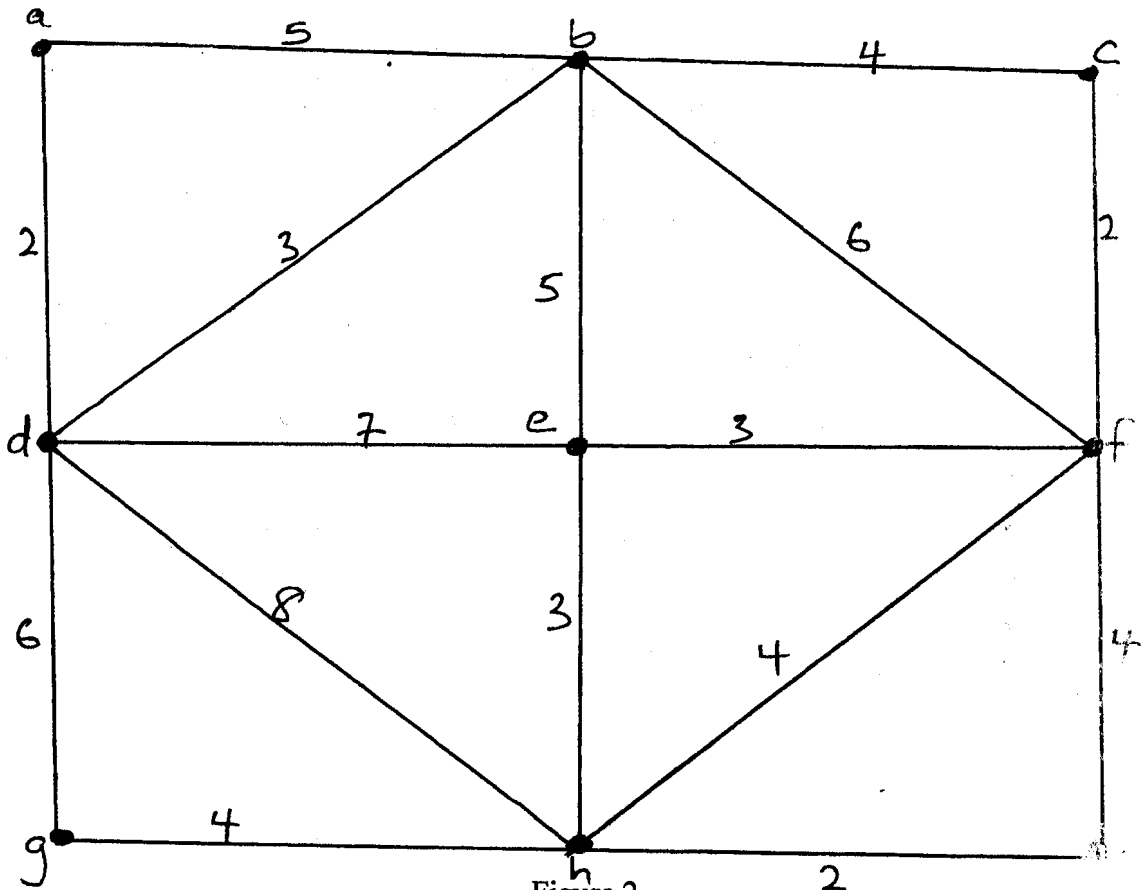

Figure 2

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