UNIVERSITY OF AGRICULTURE ABEOKUTA
COLLEGE OF NATURAL SCIENCES
DEPARTMENT OF COMPUTER SCIENCE
FIRST SEMESTER EXAMINATION (2008/2009 SESSION)

COURSE TITLE: DATA STRUCTURE AND ALGORITHMS
COURSE CODE: CSC 313   UNIT: 3   TIME ALLOWED: $2^1/_2$ HOURS

INSTRUCTION: Answer two questions from each section.

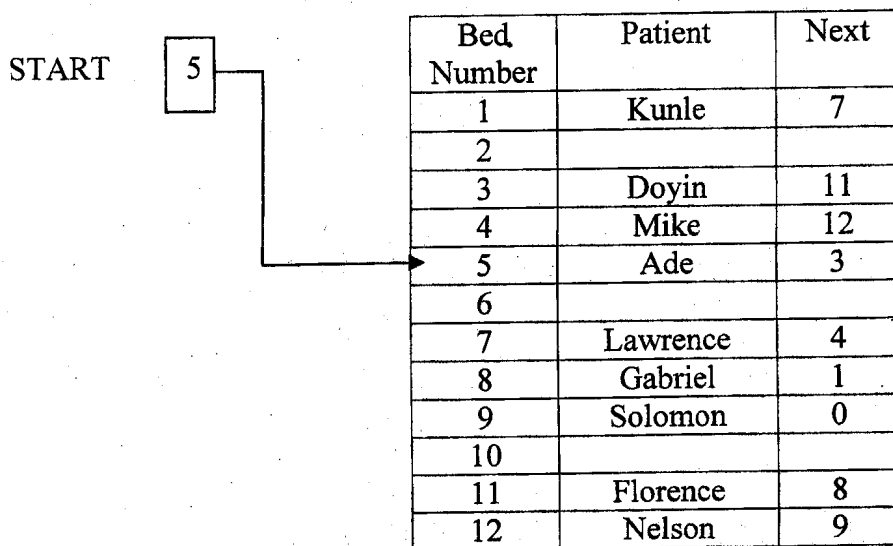## SECTION ONE

Question One

(a) What do you understand by the term "Data Structure"?   (4 marks)
(b) Explain the major role play by the six most frequently used data structure operation.   (6 marks)
(c) Find the following floor and ceiling numbers:

   (i) $\lfloor \sqrt[3]{30} \rfloor$ (ii) $\lfloor \pi \rfloor$ (iii) $\lceil 3.4 \rceil$ (iv) $\lceil \pi \rceil$ (v) $\lceil -18 \rceil$ (5 marks)

Question Two

(a) What is an array?   (3 marks)
(b) Consider the linear array CSC(5 : 60), MTS(-5 : 20) and STS (20)
(i) Find the number of elements in each array   (3 marks)
(ii) Suppose Base(CSC) = 300 and W = 4 words per memory cell for CSC. Find the
     address of CSC[20], CSC[45] and CSC[60].   (3 marks)
(c) Consider the following 4 digit employee numbers: 9614 and 5882
     Find the 2-digit hash address of each number using (i) the division method, with m = 97
     (ii) the mid-square method, (iii) the folding method without reversing.   (6 marks)

Question Three

(a) Discuss the term "Linked List".   (4 marks)
(b) Design an algorithm to transverse nodes in a linked list.   (5 marks)
(c) UNAAB Health Centre ward contains 12 beds, of which 9 are occupied as shown below.

START   5

Bed Number	Patient	Next
1	Kunle	7
2		
3	Doyin	11
4	Mike	12
5	Ade	3
6		
7	Lawrence	4
8	Gabriel	1
9	Solomon	0
10		
11	Florence	8
12	Nelson	9

(i)   Suppose a patient Helen is admitted to the ward and Helen is put in bed 10. Draw a schematic diagram of a linked list showing the changes that occur in the pointer field after admission.

(3 marks)

(ii) Suppose Gabriel is discarded after the admission, so that BED[8] is now empty. In order to maintain the linked list, what are the changes that must be executed in the pointer field? (3 marks)

SECTION TWO

Question Four

Sort the following lists using both the selection and quick sort
(a)   3, 5, 4, 1, 2, 8, 6, 9   (10 marks)
(b)   13, 15, 17, 18, 11, 19, 12, 14, 16   (10 marks)

Question Five

Construct the ordered rooted tree whose preorder traversal is a, b, f, c, g, h, i, d, e, j, k, l which **a** has four children, **c** has three children, **j** has two children, **b** and **e** have one child each and all other vertices are leaves.   (20 marks)

Question Six

(a)   In which order are the vertices of the ordered rooted tree in figure 1 visited using preorder and inorder   (10 marks)
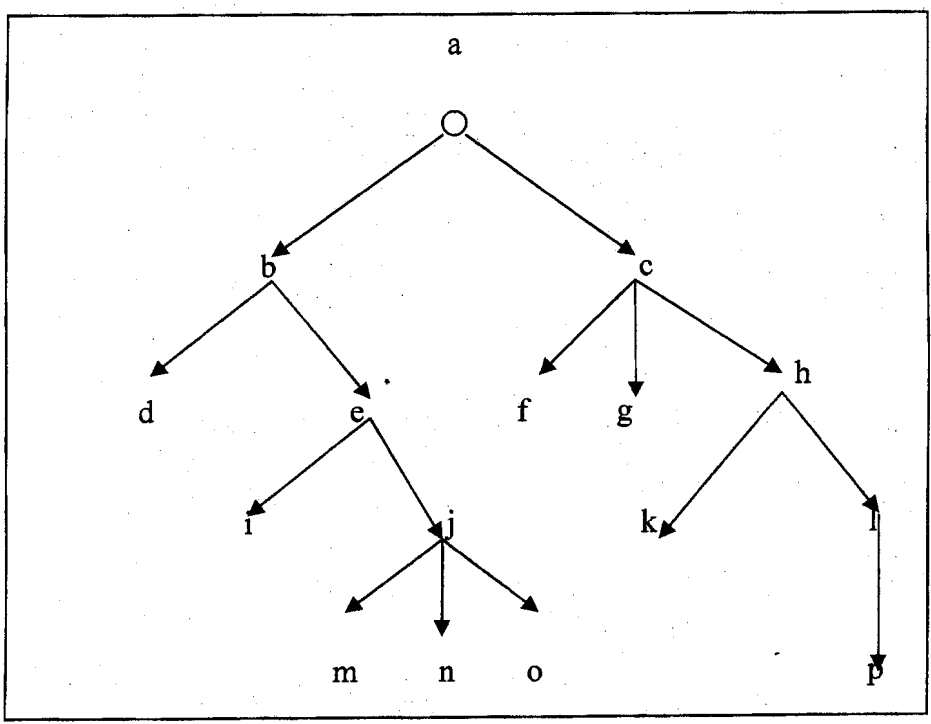

Figure 1: A tree with 5 height

(b)   Use a merge sort to sort b, d, a, f, g, h, z, p, o, and k. Show all the steps used.   (10 marks)