UNIVERSITY OF ELDORET
Com 224 Data structures
End of Semester Exam

DATE: **TIME: 2 HOURS**

Answer question ONE and ANY other TWO

QUESTION ONE

a) Explain briefly the meaning of the following terms

i. data type
ii. Abstract data type (ADT)
iii. Pointers
iv. Data structure

(4 marks)

b) For each of the following situations, which of these ADT"s (1 through 4) would be most appropriate:

i. a queue,
ii. a stack,
iii. a list,
iv. none of these?

i. The customers at a Kenchicken's counter who take numbers to make their turn
ii. Integers that need to be sorted
iii. Arranging plates in the cafeteria
iv. People who are put on hold when they call Kenya Airways to make reservations
v. Converting infix to postfix expression

(5 marks)

c) Explain why a test for an empty stack must be carried out when performing stack operations. Write a procedure/ function for the function EMPTY of a stack identifier

(4 marks)

d) I) If you push the letters A, B, C and D in order onto a stack of characters and then POP them , in what order will they be deleted from the stack (2 marks)

ii) Represent the following expression as binary tree and write prefix and postfix form of the expression

(A+B+C*D)-(A/B-CD+E) (4 marks)

f) I) Define a Queue and explain why it is also reffered to as a FIFO (2 marks)

ii) What is a priority Queue? Give an example (3 marks)

g) State and define all the possible operations on a stack data structure (6 marks)

QUESTION TWO

a) Describe how deletion of a node in between the linked list can be carried out illustrated your answer with a diagram (5 marks)

b) Beginning with an empty binary search tree what binary search tree is formed when you insert the following values in the order

i. W,T,N,J,E,B,A
ii. A,B,W,J,N,T,E

(4 marks)

c) i)Explain the importance of a head node (1 mark)

ii) State two advantages of linked list over arrays (2 marks)

iii) Each node in a doubly linked list has three fields. State the fields illustrating your answer with a diagram (2 marks)

iv) Describe the procedure of deleting an element at position P in a doubly linked list, illustrating your answer with a diagram (4 marks)

v) State one advantage of circular list (2 Marks)

QUESTION THREE

a) Convert the following infix arithmetic expression into its equivalent reverse polish form

i. A+B*C

ii. (A+B)*C
iii. A/CB-(C+D)*(E-A)*C
iv. A/B-C+D*E+A+C
(4 marks)

b) Use stack to evaluate the postfix expression ABC+D*+E+. Show the status of the stack after each step of the algorithm. Assume the following values for the identifiers: A=8, B=5, C=3, D=9, E=4. (4 marks)

c) i)Suppose that the vowels form a tree with "O" as the root and its children are "U", "I","A", left-to-right and "E" is the only child of "I". Reconstruct this tree as a binary tree (3 marks)

ii) Using double sort algorithm as it sort the following array into ascending order

20 80 40 25 60 30 (2 marks)

d) Write an algorithm for converting Numbers from Base 10 to any other given base. Use an example program to implement the algorithm (7 marks)

QUESTION FOUR

a) State the algorithm of fibonacci sequence. Use your algorithm to write a program for computing fibonacci sequence (5 marks)

b) I) Briefly define the quicksort algorithm (2 marks)

ii) Write the algorithm for the quicksort

(4 marks)

iii) Using quicksort technique sort the following data elements. Use diagrams to trace the algorithm

5 6 20 80 105 89 40 6 204 76

(9 marks)

QUESTION FIVE

a) I) construct a binary search tree using the following data

50 70 25 90 30 55 25 15 25 (3 marks)

ii) Using the above information trace the algorithm for deleting node 30

(6 marks)

iii) Using the linked list concept, write a program for manipulating a Queue structure (11 marks)