



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF INFORMATICS AND INNOVATIVE SYSTEMS

**UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR ACTUARIAL
SCIENCE**

3RD YEAR 1ST SEMESTER 2018/2019 ACADEMIC YEAR

MAIN CAMPUS

COURSE CODE: SCS 301

COURSE TITLE: DATA STRUCTURES AND ALGORITHMS

EXAM VENUE:-

STREAM:

DATE:

EXAM SESSION:

TIME : 2.00 HOURS

Instructions:

- 1. Answer Question one (Compulsory) and any TWO questions**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**
- 4. Question ONE carries 30 marks and the rest 20 Marks each**

QUESTION ONE 30 MARKS

a) Define the following terms:

- i) Data structure
- ii) Algorithm

(2marks)

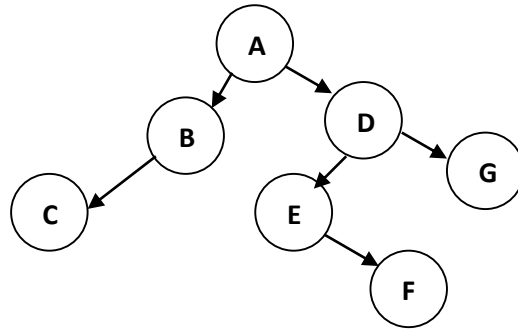
b) Differentiate between linear and non linear structures

(2 marks)

c) List 2 examples of linear and 2 examples of non linear data structures

(4 marks)

d) Write preorder traversal of the following tree



(7 marks)

e) Write an algorithm to search for particular data in a singly linked list

(5 marks)

f) Identify the basic operations that can be performed on stacks

(3 marks)

g) List 4 things that a data structure specifies

(4 marks)

h) Explain the following terms:

- i) Bubble sort
- ii) Insertion sort
- iii) Selection sort

(3 marks)

QUESTION TWO 20 MARKS

a) Explain the term 'recursive function'

(1 mark)

b) Define the following tree traversals:

- i) inorder
- ii) preorder
- iii) postorder

(3 marks)

c) Write an algorithm to push and pop items from a stack

(10 marks)

d) Differentiate between:

- i) Stack and queue

- ii) singly linked list and doubly linked list
- iii) 1-dimensional array and 2-dimensional array

(6 marks)

QUESTION THREE 20 MARKS

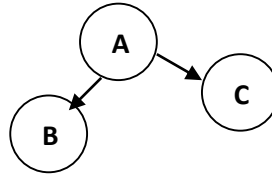
a) Define static data structure

(1 mark)

b) Give 3 examples of static data structures in C++

(3 marks)

c) Given the following tree



Define the degree of the node A

(2 marks)

d) Create a binary search tree for the following data: 40, 22, 70, 45, 60, 80, 95, 10, 25, 20

(10 marks)

e) Define the following terms:

- i) Pointer
- ii) Graph
- iii) Binary tree
- iv) Array

(4 marks)

QUESTION FOUR 20 MARKS

a) Given the following code:

```
#define MAXSIZE 100
int stack[MAZSIZE];
int top = -1;

void push(int val)
{
    if(top >= MAXSIZE)
        printf("stack overflow");
    else
        stack[++top] = val;
}

int pop()
{
    int a;
    if(top >= 0)
    {
        A = stack[top];
        top--;
    }
}
```

```

return a;
}
else
{
printf(“stack underflow,stack is empty,nothing to pop!”);
return -1;
}
}

```

- i)What is the length of the stack **(1 mark)**
- ii)Explain the work of the function push and pop **(4 marks)**
- iii)Explain the meaning of the stack[++top]=val **(2 marks)**
- iv)Explain the term stack overflow **(2 marks)**
- b) write an algorithm to populate an array with 100 items **(5 marks)**
- c)Write an algorithm for enqueue operation in queues **(6 marks)**

QUESTION FIVE 20 MARKS

a)Write the expression in the other 2 forms listed:

i) Infix: $(A-B) * C + D / E + F * G + H$

ii) Postfix: $AB - C * DEFG * + / - H$

iii) Prefix: $+ - * + ABC / D - E * FGH$

(6 marks)

b) Differentiate between:

i) Directed and undirected graph

(2 marks)

ii) Cyclic and acyclic graph

(2 marks)

c) List 3 properties of an algorithm

(3 marks)

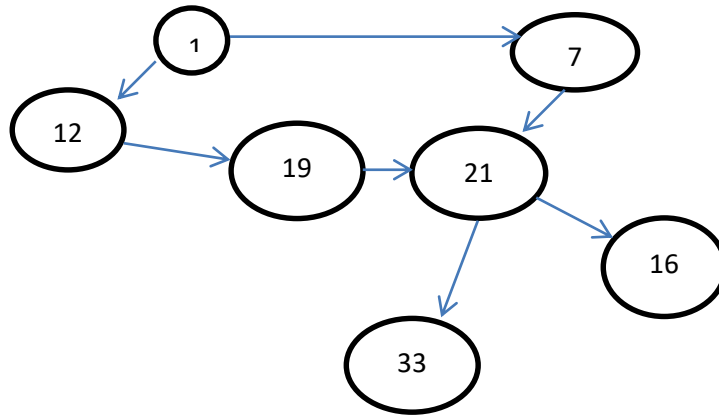
d) Define the following terms as used in algorithms

i) Time complexity

ii) Space complexity

(4 marks)

e) Given the following graph:



- i) Identify the type of the graph
- ii) How many vertices does the graph have
- iii) Name the predecessors of 21

(3 marks)