



Machakos University College

[A Constituent College of Kenyatta University]
University Examinations for 2015/2016 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

FIRST SEMESTER EXAMINATION FOR DEGREE IN BACHELOR OF
SCIENCE IN INFORMATION TECHNOLOGY
SIT 206: DATA STRUCTURES AND ALGORITHM

Date: 8/08/2016

Time: 2:00 – 4:00 pm

INSTRUCTION

Answer question **ONE** and **Any other Two** among the four selective questions

QUESTION ONE (COMPULSORY)

- (a) Differentiate between (8 marks)
- (i) Linked list and array
 - (ii) ADT and data structure
 - (iii) Time complexity and space complexity of an algorithm
 - (iv) Depth First Search and Breadth First Search
- (b) Explain any three properties of an algorithm (6 marks)
- (c) Given the postfix notation [5, 6, 2, +, *, 12, 4, /, -]. Evaluate the postfix notation using a stack(use a table) (6 marks)
- (d) Explain the output of the code below (2 marks)

```
# include <stdio.h>
main ( )
{

    int a, b=0;
    static int c [10]={1,2,3,4,5,6,7,8,9,0};
    for (a=0; a<10; ++ a)
        if ((c[a]%2) == 0) b+ = c [a];
    printf("%d", b);
}
```

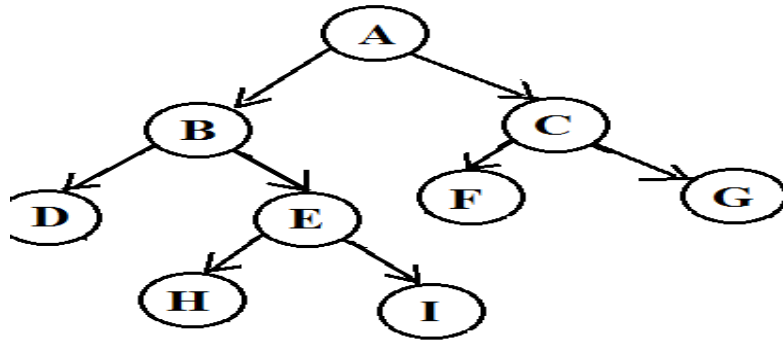
- (e) Write a program to store names and marks of 6 students using structure in C language. (5 marks)
- (f) Explain any three basic properties of Graph (3 marks)

QUESTION TWO

a) Traverse the following tree below in (8 marks)

- (i) Inorder
- (ii) Preorder
- (iii) Postorder

And give an output



b) Define sorting algorithm and explain how to calculate their complexities (5 marks)

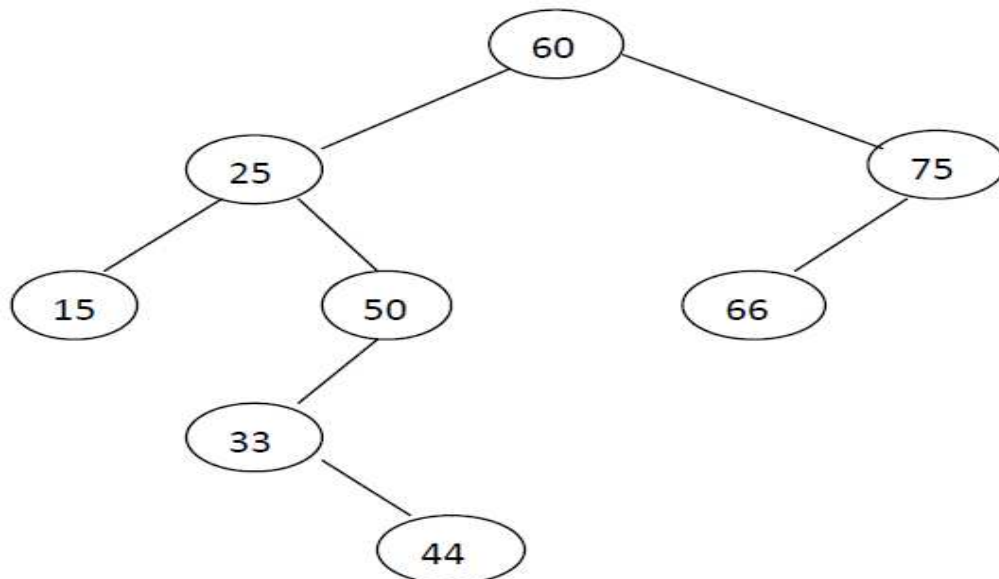
c) Define a queue and explain three operations on a queue (7 marks)

QUESTION THREE

a) Write an algorithm for infix to post fix conversion (5 marks)

b) For the given Binary Search Tree T, perform the following sequence of operations (5 marks)

- (i) Delete 44
- (ii) Delete 75



- c) Explain pointers and structures by giving an example of pointer to structure variable (4 marks)
- d) Explain any three applications of graph data structures (6 marks)

QUESTION FOUR:

- a) Given a stack s and a queue q , show the contents of each after the indicated operations. The starting contents of s and q are shown. If an operation would result in an error, write “error” and assume the contents of s and q do not change. If there is no change otherwise, leave the cell blank or use ditto marks (“”). (8 marks)

Operation	Contents of stacks		Contents of queue q	
	Top	bottom	front	rear
<i>Start</i>	<i>empty</i>		2, 4	
$s.pop()$				
$s.push(3)$				
$q.add(5)$				
$s.push(q.peek())$				
$q.add(s.peek())$				
$q.add(s.pop())$				
$s.push(s.pop())$				
$q.add(q.remove())$				

- b) Differentiate between polynomial ADT and large integer ADT giving example in each case (4 marks)
- c) State two importances of data structures in programming. (2 marks)
- d) Describe the following sorting algorithms (6 marks)
- Selection sort
 - Quick sort

QUESTION FIVE:

- a) Using a diagram explain the following types of linked lists (4 marks)
- Circular singly linked list
 - Linearly doubly linked list
- b) Write a C language program to read two matrices and add them and print their sum. (6 marks)
- c) Using diagram, explain the key features of a tree data structure: (7 marks)
- d) Given an array $int\ a[3]$ containing three elements such that $a[0] = 12; a[1] = 9; a[2] = 14$; and Consider the first element is stored in the address of 1020. Calculate the addresses where the other two elements will be stored. (3 marks)

