



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 MATHEMATICS AND COMPUTER SCIENCE

SCO204: 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

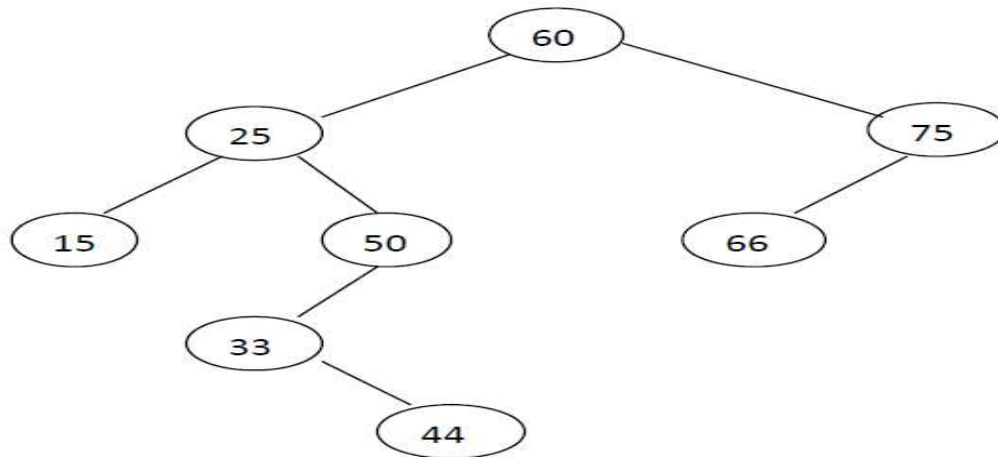
QUESTION ONE (COMPULSORY)

- (a) Explain any two properties of an algorithm (4 marks)
- (b) Define linked list and write an algorithm for inserting an ITEM in the beginning of the linked list (5 marks)
- (c) Given the postfix notation [5, 6, 2, +, *, 12, 4, /, -]. Evaluate the postfix notation using a stack(use a table) (6 marks)
- (d) Using a tree of length 3 with siblings, parents and leafs, show how to convert general tree to binary tree (5 marks)
- (e) Write a C program to read two matrices, multiply them and print their products. (5 marks)
- (f) Explain the bold sections of the code and why it will not have an output (5 marks)

```
myfunc ( struct test t) {  
strcpy(t.s, "world");  
}  
main() {  
struct test { char s[10]; } t;  
strcpy(t.s, "Hello");  
printf("%s", t.s); myfunc(t);  
printf("%s", t.s);  
}
```

QUESTION TWO

- a) For the given Binary Search Tree T, perform the following sequence of operations (7 marks)
- (i) Delete 75
 - (ii) Delete 25
 - (iii) Delete 44 and show the graph after each



- b) Define sorting algorithms and explain how to calculate their complexities (5 marks)
- c) Write a code to implement a queue using arrays in which insertions and deletions can be made from either end of the structure (such a queue is called deque). Your code should be able to perform the following operations (8 marks)
- (i) Insert element in a deque
 - (ii) Remove element from a deque
 - (iii) Check if deque is full
 - (iv) Initialize it

QUESTION THREE

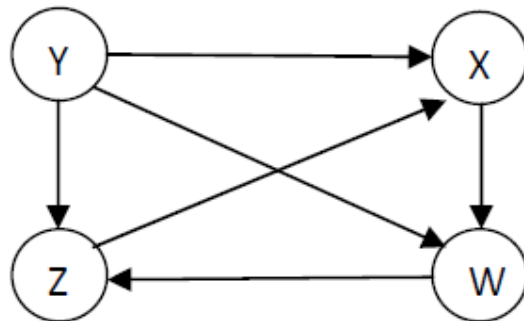
- a) By using example, Explain how to traverse the tree using Breadth First Search (5 marks)
- b) Given a stack s and a queue q , show the contents of each after the indicated operations. The starting contents of s and q are shown. If an operation would result in an error, write “error” and assume the 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
Start	empty		2, 4	
s.pop()				
s.push(3)				
q.add(5)				
s.push(q.peak())				
q.add(s.peak())				
q.add(s.pop())				
s.push(s.pop())				
q.add(q.remove())				

- c) Declare a structure to store the following information about an employee Name, Sex(male, female), Marital_status(single, married, divorced or widowed), age.(using bit fields) (4 marks)
- d) State any three examples of ADTs (3 marks)

QUESTION FOUR:

- a) Write an algorithm for infix to post fix conversion (5 marks)
- b) Draw the Adjacency Matrix of the following graph (4 marks)



- c) 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)
- d) Describe the following sorting algorithms (use examples) (8 marks)
- Selection sort
 - Quick sort

QUESTION FIVE:

- a) Explain pointers and structures by giving an example of pointer to structure variable (5 marks)
- b) Draw the binary tree from given PRE – GBQACKFPDERH and IN –QBKCFAGPEDHR
Order Traversal. (6 marks)
- c) Write a C program using a stack for base conversions. (5 marks)
- d) Explain polynomial ADT and large integer ADT giving example in each case (4 marks)