



KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2011/2012
SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR
OF SCIENCE (COMPUTER ENGINEERING)

SCE 311: DATA ABSTRACTION AND ALGORITHMS

DATE: Tuesday, 10th April, 2012

TIME: 8.00 a.m. – 10.00 a.m.

INSTRUCTIONS:

Answer three questions. Question ONE is compulsory. Each question has equal marks.

Q1

(a) Using your knowledge of ASCII table which of the following expressions are true? (2marks)

- i. "a" > "B"
- ii. "1" <= "]"
- iii. "1" >= "]"
- iv. "24.0" != "24"

(b) Using diagram consider this set of statements and show what is printed? (2marks)

```
int a = 15;  
int* p = &a;  
int* q = &a;  
*p = *p + 10;  
cout << *q << endl;
```

(c) The function below passes the values A and B by value. Modify the function so as to pass values by reference. What is the principle benefit of passing value by reference rather than by value (2 marks)

```
int sumOf( int A, int B)  
{  
    return A+B;  
}
```

(d) Define an enumerator in C++ for a menu system that uses single letters to make a menu selection. The menu looks as follows [A]dd [E]dit [D]elete [P]rint e[X]it. (4marks)

- (e) With the aid of appropriate example and illustration discuss how a Binary search works and state the reason why it works better than a bubble search(4 marks)
- (f) Briefly discuss the purpose of the Standard Template Library in C++ and draw an illustration to show the componets available under each of the main categories (6marks)

Q2.

- (a) With the aid of simple C++ code differentiate between static declaration of variables and dynamic declaration of variables (2 marks)
- (b) With aid of an example show one advantages of using pointers in C++ programming (4 marks)
- (c) Design a data structure to store student's marks containing student identification student name cat 1 marks, cat 2 marks, lab marks, exam marks, total marks, and grade. Show how you would use this structure to create an array for entering marks for 100 students (4 marks)
- (d) Design a function in C++ that uses an array to find the 20th root of the product of 20 elements. (10marks)

Q3.

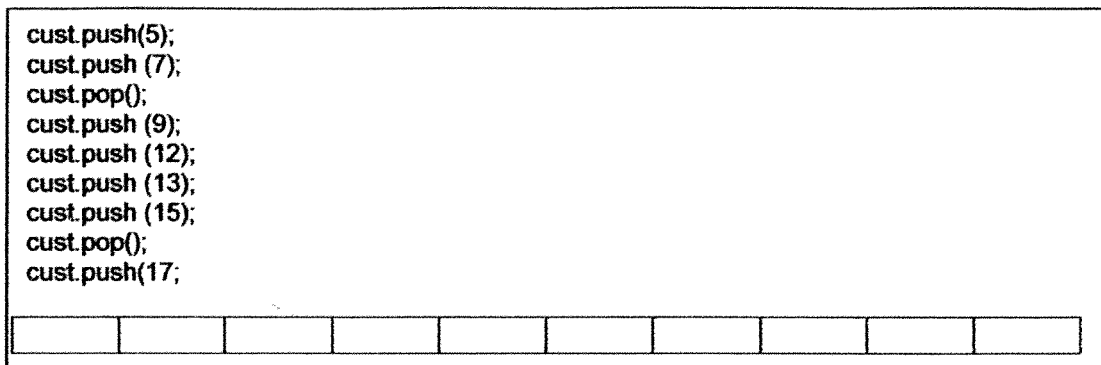
- (a) Discuss the advantages and disadvantage of the abstract data structure vector (2 marks)
- (b) Discuss the purpose and characteristics of the ADT map/multi-map container and give example of situations where it can be useful (4 marks)
- (c) Show the contents of the vector names after the following statements and show how you would printout the elements in names(4 marks)

```
vector<string> names;  
names.push_back("NBI");  
names.push_back("MSA");  
names.pop_back();  
names.push_back("MLD");  
names.push_back("LMU");  
names.pop_back();
```

- (d) Using vector design functions to (i) add (ii) update (ii) delete account information with the following fields Account number, Account Name, Account Balance(10 marks)

Q4 .

- (a) Using an illustration describes the basic structure of link lists and how the program knows the beginning and end of the list. (2 marks)
- (b) Design a link list using STL for storing names of cities and for each city have the ability to store an infinite list of street names (4 marks)
- (c) The following operations are performed on an empty queue: Insert numbers in the provided diagram to show what will be stored in the queue after the last operations have executed (4 marks)



- (d) Design a simple program to serve a queue of customer in a bank. Every time a customer arrives a ticket number is given representing the position of the customer arrived in the queue. When it is the next customers turn to be served a message is displayed "Next Customer number [?]" and the number is dropped from the queue (10 marks).

Q5

- (a) Differentiate between random file access and sequential file access (2 marks)
- (b) Describe big O and show at least 2 examples how it is used(2 marks)
- (c) Write pseudo or C++ code for a binary search, what is the Big O for this search method and what are the key issues with this method (4 marks)

- (d) With the aid of an illustration discuss hashing bucket hashing in performing searches (6 marks)
- (e) The STL contains standard algorithms, list the various categories of these algorithms and describe two functions under each category.(6 marks)