

SCHOOL OF PROFESSIONAL STUDIES

BACHELOR OF INFORMATION COMMUNICATION TECHNOLOGY

UNIT CODE: BCT 212, UNIT NAME: DATA STRUCTURES AND ALGORITHMS

September – December 2018/2019 End Semester Exam - Time: 2 Hours

Instructions: Answer Question ONE (Compulsory) and any other TWO questions.

QUESTION 1 COMPULSORY (30 marks)

a) Define the following terms:

- (i) Algorithm (1 mark)
- (ii) Array (1 mark)
- (iii) Data structure (1 mark)
- (iv) Queue (1 mark)

b) Assume that you're a software developer for a given company and you have been requested to develop a C++ program that does the following:

- i) Accepts inputs of the ages of 10 employees of the company. The values of the ages are of integer data type.
- ii) Stores the values of the ages in an array named emplAges.
- iii) Outputs the values of the ages of the second and seventh employees.

Write the above program segment. (6 marks)

- c) Describe the two types of errors that may occur in a C++ program. (4 marks)
- d) Stacks are special kinds of lists with unique operation. Explain any three stack operations.

(3 marks)

e) How does a queue differ from a stack in its operation

(3 marks)

f) A linked list is a crucial data structure in software development. Identify any six operations that may be applied and their use.

(6 marks)

g) Rewrite the following program after removing the syntactical errors (if any). Underline each correction.

(4 marks)

```
struct Pixels
{
    int color, style;
}

void showPoint(Pixels P)
{
    cout << P.color, P.style << endl;
}

int main()
{
    Pixels Point1 = (5, 3);
    showPoint(Point1);
    Pixels Point2 = Point1;
    color.Point1 += 2;
    showPoint(Point2);

    return 0;
}
```

QUESTION 2 (20 marks)

a) Consider an array of 5 elements, why do you think that it is necessary to track the valid index interval.

(1 mark)

b) Briefly explain how the below program segment executes until it terminates.

```
for( i=1; i<=30; i++)
{
    cout << i;
}
```

(5 mks)

c) Consider the array below:

```
int bictmarks1[5] = {56,78,86,54,60};
```

Write a C++ code fragment that copies the values in the array to a new array named bictmarks2.

(5 mks)

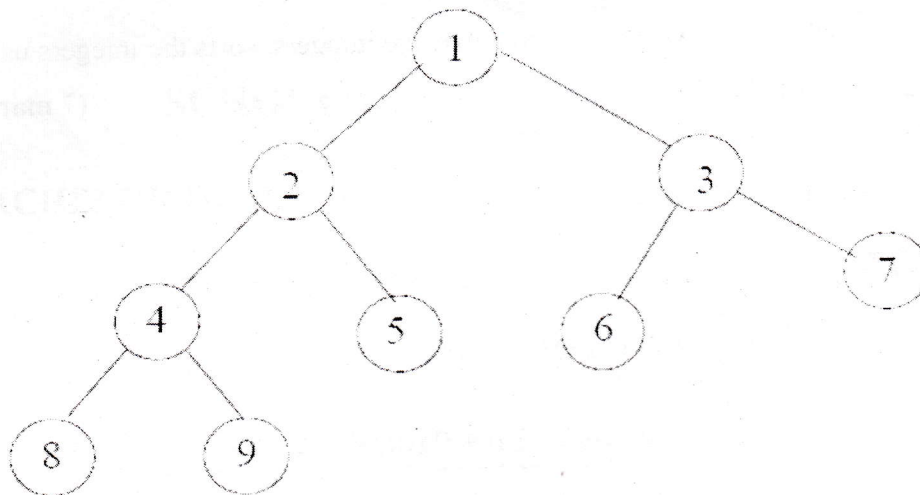
d) Differentiate between software validation and software verification.

(4 mks)

QUESTION 3 (15 marks)

- a) Identify any four types of software testing. (4 marks)
- b) Trees are ideally suited to representing hierarchical relationships among elements in a universe.

Consider the tree show below.



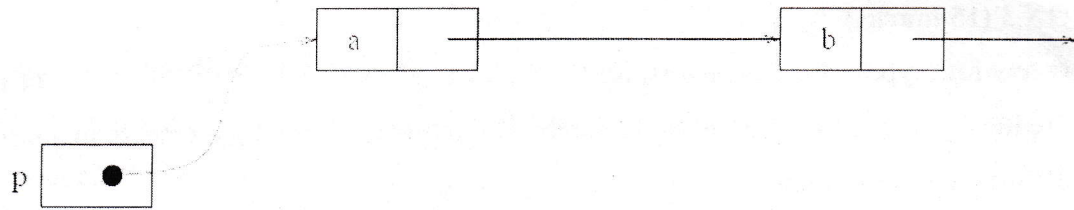
- (i) Determine the preorder, inorder and postorder of the tree traversals. (9 marks)
- (ii) Is the above binary tree complete, if yes give reasons. (2 marks)

QUESTION 4 (15 marks)

- a) Consider the following list: 38, 27, 43, 3, 9, 82, and 10. Showing clearly the list in each iteration, sort the list in ascending using:
- (i) Bubble sort (3 marks)
 - (ii) Merge sort (3 marks)
 - (iii) Selection sort (3 marks)
 - (iv) Insertion sort (3 marks)
- b) Describe the two types of comments as used in C++ programming and use an example for each to show how each can be coded in a program. (3 marks)

QUESTION 5 (15 marks)

- a) Describe any three types of documentation which can be used in software development. (3 marks)
- b) Using brief statements, describe how you can insert another node between the nodes a, and b in the linked list below. (5 marks)



- c) Write a C++ program segment that allows the user to enter five integers, sorts the integers using bubble sort, and outputs the sorted list. **(7 marks)**