Code: AE52/AC52/AT52
Subject: C & DATA STRUCTURES

ROLL NO. _____

AMIETE – ET/CS/IT (Current Scheme)

Time: 3 Hours **DECEMBER 2018** **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 Minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer FIVE Questions, selecting at least TWO questions from each part. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or the best alternative in the following: (2×10)

a. Consider the following two statements on operators in C and choose statement(s) which is/are true.
I. The operator <= has higher precedence than !=
II. The equality operator is =.
(A) I only **(B)** II only
(C) Both I and II **(D)** Neither I nor II

b. Which of the following data type does not belong to integer data types family in C?
(A) int **(B)** float **(C)** char **(D)** short int

c. What is the output of the following code?

```
int a = 5, b= 16;
a = a >b ? a : b;
printf("\n value of a is %d\n", a);
```

(A) 5 **(B)** 16 **(C)** 21 **(D)** 0

d. Consider the following two statements on C functions and choose statement(s) which is/are true.
I. C uses the method of parameter passing by value for function calls
II. The parameter used for writing the function is called the formal parameter.
(A) I only **(B)** II only
(C) Both I and II **(D)** Neither I nor II

e. The size of the union marks as defined below is

```
union marks      \\ A
{
   float perc;   \\ B
   char grade;   \\ C
}
```

(A) 1 **(B)** 2 **(C)** 3 **(D)** 4

f. When a contiguous list is _____, it can be implemented by using an _____
(A) static, array **(B)** dynamic, array
(C) dynamic, stack **(D)** static, stack

g. Order of the bubble sort algorithm is
(A) O(log n) **(B)** O(n)
(C) $O(n^3)$ **(D)** $O(n^2)$

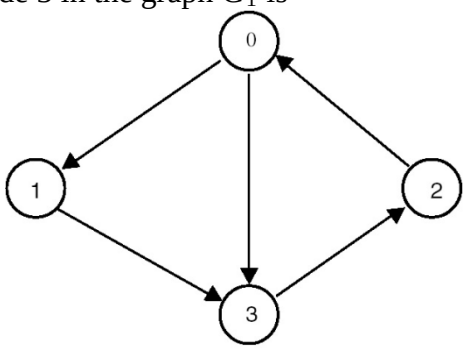
h. If p is a pointer to the start of a singly linked list, what does the following code do?

```
while(p != NULL)
{
        temp = p;
        p = p->link;
        free(t);
}
```

(A) Empty the values of all the nodes in the list
(B) Copy the list to another list
(C) Erase the list and free memory
(D) Erase the list

i. Consider the following two statements about binary trees and choose statement(s) which is/are true.
I. If k is the depth of the tree then the maximum number of nodes that the tree can have is $2^k - 1 = 2^{k-1} + 2^{k-2} + \ldots + 2^1$
II. The maximum number of nodes at level i will be 2^{i-1}
(A) I only **(B)** II only
(C) Both I and II **(D)** Neither I nor II

j. Indegree of node 3 in the graph G_1 is



Graph G_1

(A) 1 **(B)** 2
(C) 3 **(D)** 4

PART-A

Answer at least TWO Questions from this part. Each question carries 16 marks.

Q.2 a. Write a C program to print the sizes of char, integer, float and double data types in bytes. **(4)**

b. Describe the right shift operation in C with an example. **(6)**

c. Write a note on single precision floating point number in C. **(6)**

Q.3 a. For a bank, the interest rates based on customer types are given below. Write a C program to get the customer type from customer (as 'I', 'G' or 'C'), principal amount, and number of years to print the simple interest for the customer. Include a do-while loop in your program so that interest is computed for 5 customers. (Simple Interest I = P x N x R), where P = principal amount, N =

number of years and R = interest rate. Use switch statement for checking customer type and selecting appropriate interest rate. **(8)**

Customer Type	Customer	Interest Rate
I	individual	5.5
G	Government	6.0
C	Corporate	6.8

b. Given two integers m and n, write a C program to compute the sum of all integers between m and n, using a for loop. Ensure the following requirements are satisfied.

- The program should obtain the values of m and n from the user.
- The sum should not include the integers which are multiples of 7 and lie between m and n.
- If the sum exceeds 1000 during the loop, exit from the loop and print the current sum. Otherwise print the sum at the end of the loop.
  (For example if m = 10 and n = 15, sum should be 11+12+13 = 36, which does not include 14 a multiple of 7) **(8)**

Q.4 a. Given n, write a program to compute 1+2+...+n using recursion. **(4)**

b. With a suitable example, highlight the sequence of execution during a function call. **(8)**

c. What is a global variable? What are the disadvantages of using a global variable? **(4)**

Q.5 a. Write a C program to accomplish the following: Assume that a file names.txt contains 10 names, with each name in a single, separate line. Read the names from the files. Ensure that the first letter is uppercase for all the names; if not, change the first letter to be in uppercase. Finally write the remaining names into a text file names “ProperNames.txt”. **(8)**

b. With an example, show how a structure can be processed using a pointer? **(4)**

c. How can a string be passed as a parameter to a function? Explain with an example. **(4)**

PART-B

Answer at least TWO Questions from this part. Each question carries 16 marks.

Q.6 a. Write a C program to implement Quicksort. Trace your program with the following inputs and sort them in ascending order : 7, 99, 23, 11, 65, 43, 23, 21, 21, and 77 **(10)**

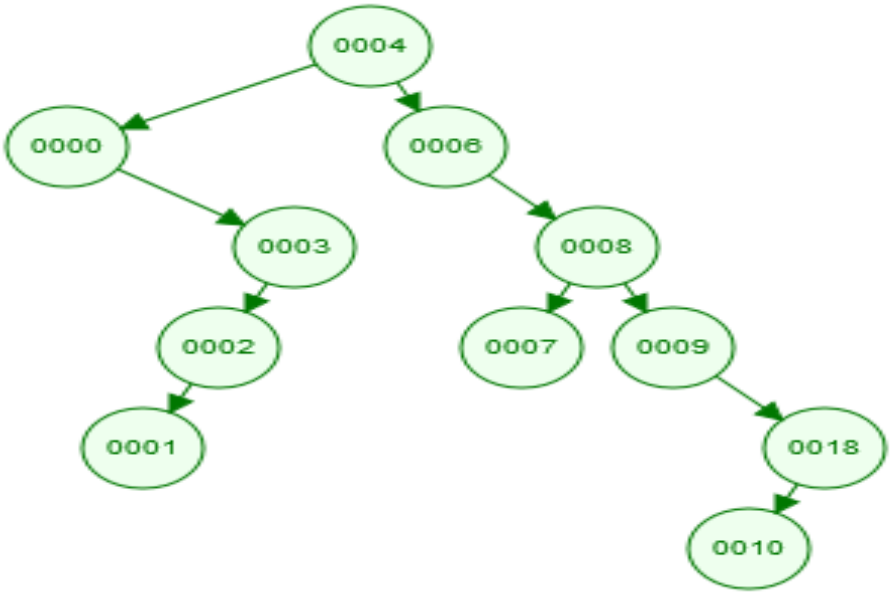
b. What is binary search? Implement binary search using C for the following function prototype. **(6)**
void bsearch(int list[],int n,int element)

Q.7 a. Describe stack data structure. Write a program to implement stack using array. **(10)**

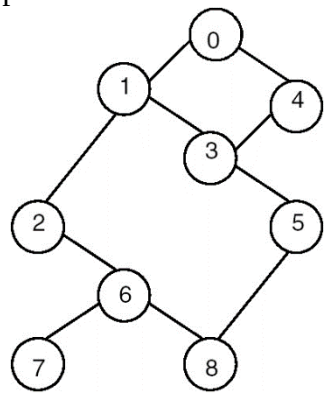
b. Discuss the disadvantages of singly linked lists. Illustrate how the doubly linked list in addressing those disadvantages? Show the organization of doubly linked circular list and doubly linked circular list with a header node with suitable diagrams. **(6)**

Q.8 a. Provide C functions for inorder, preorder and postorder traversal of a binary tree using recursion. List your assumptions clearly. **(8)**

b. From the following binary search tree delete the nodes 6, 8, 3 and 4 one after the other **(8)**



Q.9 a. Write a complete program for depth-first traversal of a graph. Using your program perform depth-first traversal for the following graph. **(10)**



b. Illustrate Minimum Cost Spanning Tree, with an example. Provide an algorithm to find Minimum Cost Spanning Tree **(6)**