

AMIETE – CS/IT (New Scheme)

Time: 3 Hours

June 2019

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 any FIVE Questions. 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 definition in C programming language

```
struct node
{
    int data;
    struct node * next;
}
typedef struct node NODE;
NODE *ptr;
```

Which of the following C code is used to create new code?

- (A) `ptr = (NODE*)malloc(sizeof(NODE));`
- (B) `ptr = (NODE*)malloc(NODE);`
- (C) `ptr = (NODE*)malloc(sizeof(NODE*));`
- (D) `ptr = (NODE)malloc(sizeof(NODE));`

- b. What does the following function do for a given Linked List with first node as head?

```
{
    if(head == NULL)
        return;
    fun1(head->next);
    printf("%d ", head->data);
}
```

- (A) Prints all nodes of linked lists
- (B) Prints all nodes of linked list in reverse order
- (C) Prints alternate nodes of Linked List
- (D) Prints alternate nodes in reverse order

- c. 'ptrdata' is a pointer to a data type. The expression *ptrdata++ is evaluated as (in C++):
(A) *(ptrdata++) (B) (*ptrdata)++
(C) *(ptrdata)++ (D) Depends on compiler
- d. The following numbers are inserted into an empty binary search tree in the given order:
10, 1, 3, 5, 15, 12, 16
What is the height of the binary search tree?
(A) 5 (B) 6
(C) 3 (D) 4
- e. Level order Traversal of a rooted Tree can be done by starting from root and performing
(A) Breadth First Search (B) Depth First Search
(C) Root Search (D) Deep Search
- f. A list of n strings, each of length n, is sorted into lexicographic order using merge-sort algorithm. The worst case running time of this computation is
(A) $O(n^3)$ (B) $O(n \log n)$
(C) $O(n^2 + \log n)$ (D) $O(n^2 \log n)$
- g. What is the return value of f(p,p), if the value of p is initialized to 5 before the call? Note that the first parameter is passed by reference, whereas the second parameter is passed by value.

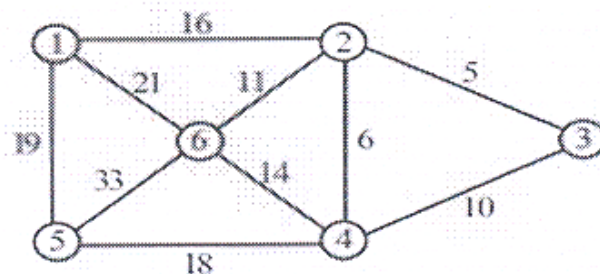
```
int f(int &x, int c) {  
    c = c - 1;  
    if(c==0) return 1;  
    x = x + 1;  
    return f(x,c) * x;  
}
```


(A) 3024 (B) 6561
(C) 55440 (D) 161051
- h. A Hash Function f is defined as $f(\text{key}) = \text{key} \bmod 7$. With linear probing as storage and collision resolution mechanism while inserting the keys 37, 38, 72, 48, 98, 11, 56 into a table indexed from 0, in which location the key 11 will be stored (Count table index 0 as 0th location)?
(A) 3 (B) 4
(C) 5 (D) 6
- i. The given array is arr = {3,4,5,2,1}. The number of iterations in bubble sort and selection sort respectively are
(A) 2 and 5 (B) 2 and 4
(C) 4 and 5 (D) 4 and 4

- j. Which of the following is non-linear data structure?
 (A) Stack (B) Queue
 (C) Tree (D) Records

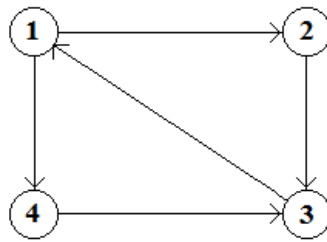
**Answer any FIVE Questions out of EIGHT Questions.
 Each question carries 16 marks.**

- Q.2** a. Explain the use of pointers in passing an Array to a function. Explain with example. (8)
- b. What is recursion? Write a program to find a term in Fibonacci series using recursion. (8)
- Q.3** a. Describe the Linked implementation of Stacks. (10)
- b. Convert the following infix expression into postfix form. (6)
- (i) $A^{\wedge}B * C - D + E / F / (G + H)$
- (ii) $(A + B) * (C^{\wedge}(D - E) + F) - G$
- Q.4** a. What is Singly (Linear) Linked List? Write an algorithm to count the number of nodes in a given singly linked list. (8)
- b. Write algorithms to insert into and delete elements from a doubly linked list. (8)
- Q.5** a. Write cases for deletion of a node from a binary search tree. (4)
- b. Construct AVL search tree by inserting the following elements in order of their occurrence (6)
- 68,5,38,24,18,116,92,82,48
- c. Write a Program to count the number of leaf nodes in a binary tree. (6)
- Q.6** a. Consider the graph $G = (V, E)$ given below. (12)



Find minimum spanning tree using Prim's algorithm.

- b. Obtain the adjacency-matrix, adjacency list representation of the following graph (4)



- Q.7** a. Given input (4371,1323,6173,4111,4299,9669,1989) and a hash function $h(X)=X \bmod 10$. Show the result of open addressing hash table using linear probing. (8)
- b. Write Binary Search Algorithm and explain its working. (8)
- Q.8** a. Write the complete Quick-sort algorithm including any algorithm it uses. Analyze its runtime. (8)
- b. Show how Insertion Sort processes the input 142,543,123,65,453,879,572,434,111,242,811,102,125 and 146 (8)
- Q.9** a. How are files organized on the disk? Explain with suitable diagram and example. (8)
- b. Write a program to create a file; read and display the contents of the file. (8)