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

AMIETE – ET/CS/IT

Time: 3 Hours   **DECEMBER 2013**   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. Give the output for the following code:
```
for ( ch = (int) 'd'; ch < (int ) 'n'; ch += 3)
{ printf( "%c", (char ) ch);
}
```

   (A) 68697071   **(B)** dgjm
   (C) dgdj   **(D)** Error

b. To move the file pointer to a specific location which of the following function is used.

   (A) int fseek(FILE *fp, long int numbytes, int origin);
   (B) int fread(FILE *fp, long int numbytes, int origin);
   (C) int fwrite(FILE *fp, long int numbytes, int origin);
   (D) int fpos(FILE *fp, long int numbytes, int origin);

c. _____is a data structure used to store collection of data times of _____type.

   (A) int, same respectively   **(B)** array, multiple respectively
   (C) double, void respectively   **(D)** array, same respectively

d. What are the values of m, n and p after execution of the following code:
```
int j =15, k =12;
int main()
{
n = j - ++k;
m = j-- + k--;
p = ++k + j--;
printf("m = %d, n = %d, p= %d",m, n, p);
}
```

   (A) n=3, m = 26, p = 28   **(B)** n=2, m = 28, p = 30
   (C) n=2, m = 28, p = 27   **(D)** Error in code

e. A _____ is a memory location that is shared by _____ different types of variables.

   (A) union, two or more respectively
   (B) structure, one respectively
   (C) enumerations, two or more respectively
   (D) union, enumeration respectively

f. Extra memory of $O(n)$ is needed in _____

   (A) Radix sort   **(B)** Insertion sort
   (C) Quick sort   **(D)** Merge sort

g. Recursion is implemented using _____

   (A) Stacks   **(B)** Linked List
   (C) Queues   **(D)** All of these

h. The maximum number of nodes in a binary tree of depth k is _____ where $k \geq 1$.

   (A) $2^k - 2$ **(B)** $2^k - 1$
   (C) $2^k + 1$ **(D)** 2^k

i. Graph traversing algorithms like breadth first search and depth first search use the following data structures

   (A) linked list, queue   **(B)** stack, linked list
   (C) queue, stack   **(D)** None of these

j. Dynamic storage management is implemented using _____

   (A) graphs   **(B)** queues
   (C) stack   **(D)** linked list

PART (A)
Answer at least any TWO Questions. Each question carries 16 marks.

Q.2 a. Mention any five data types in C. Give their respective size in bits and range. **(5)**

    b. Write short notes on type casting. **(3)**

    c. Write a program to illustrate the usage of any four bitwise operators and give the corresponding output. **(4)**

    d. Give the tabular format to indicate precedence of operators in C language. **(4)**

Q.3 a. Compare while, do-while and for loop statements in C programming language. **(5)**

b. Mention the role of the following for printf() and scanf() statements:
    (i) Type identifiers   (ii) Field width
    (iii) Precision   (iv) Flags
    (v) Escape Sequence   **(5)**

c. Explain the role of address and pointers in C language. Give an example of each for illustration.   **(6)**

Q.4 a. Explain recursion with the help of an example.   **(6)**

b. Explain the following with respect to functions and give an example for illustration:
    (i) call-by-value   (ii) call-by-reference   **(6)**

c. How can array elements be accessed using pointers? Give an illustration.   **(4)**

Q.5 a. Using array of strings, write a program to display strings January to December.   **(5)**

b. List any four file operations.   **(4)**

c. Consider a structure Student with data members - char name[20] and float tmarks. Write a program to read and display the values of data members: name and tmarks using pointer to student structure.   **(7)**

PART (B)
Answer at least TWO Questions. Each question carries 16 marks.

Q.6 a. Give the worst case and average case complexities for the following:
    (i) Quick sort   (ii) Merge sort
    (iii) Heap sort   **(6)**

b. Write a C program to merge two sorted lists.   **(6)**

c. Define Binary Search Tree. Give an example for illustration.   **(4)**

Q.7 a. Mention the applications of stacks and queues.   **(4)**

b. Write a C program to illustrate the following operations in doubly linked list:
    (i) Insert a new value after the specified value
    (ii) Delete a new value after the specified value   **(6)**

c. Give the polynomial representation of linked list.   **(3)**

d. Give an example to illustrate empty linked list with header and trail nodes.   **(3)**

Q.8 a. Write a program to search for a target key in a binary search tree.   **(6)**

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b. Write sequence of steps for the following tree traversals:
   (i)   Preorder   (ii) Inorder
   (iii) Postorder   **(6)**

c. Give the Big O comparisons for binary search tree and linked list for the following operations:
   (i) FindElement()   (ii) MakeEmpty()   **(4)**

Q.9   a. Give an example to illustrate array and linked list representation of graphs.   **(4)**

b. Write the algorithm for depth first search (DFS) and give its analysis.   **(4+4)**

c. Explain direct acyclic graph with an example.   **(4)**