ROLL NO. _____

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

# AMIETE – ET/CS/IT

**Time: 3 Hours** **JUNE 2013** **Max. Marks: 10**

***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, 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.**

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

a. The following program fragment

```
int  x = 4,    y = x,  i;
for (i = 1;    i < 4;   ++ i)
x + = x;
```

outputs an integer that is same as

**(A)** 8 * y
**(B)** y * ( 1 + 2 + 3 + 4)
**(C)** y * 4
**(D)** y * y

b. If storage class is missing in the array definition, by default it will be taken to be

**(A)** automatic
**(B)** external
**(C)** static
**(D)** either automatic or external depending on the place of occurrence

c. Forward declaration is absolutely necessary

**(A)** if a function returns a non-integer quantity
**(B)** if the function call precedes its definition
**(C)** if the function call precedes its definition and the function returns a non integer quantity
**(D)** none of these

d. puts (argv [0]) ;

**(A)** prints the name of the source code file
**(B)** prints argv
**(C)** prints the number of command line arguments
**(D)** prints the name of the executable code file

e. The running time of an algorithm T(n), where 'n' is the input size is given by

$$T(n) = 8T(n/2) + qn, \text{if } n > 1$$
$$p, \text{ if } n = 1$$

where p, q are constants. The order of this algorithm is

**(A)** $n^2$ **(B)** $n^n$ **(C)** $n^3$ **(D)** n

f. The depth of a complete binary tree with 'n' nodes is (log is to the base two)

**(A)** log (n+1) – 1 **(B)** log (n)
**(C)** log (n-1) + 1 **(D)** log (n) + 1

g. The minimum number of edges in a connected cyclic graph on n vertices is

**(A)** n-1 **(B)** n **(C)** n+1 **(D)** none of these

h. A binary search tree contains the values – 1,2,3,4,5,6,7 and 8. The tree is traversed in preorder and the values are printed out. Which of the following sequences is a valid output?

**(A)** 5 3 1 2 4 7 8 6 **(B)** 5 3 1 2 6 4 9 7
**(C)** 5 3 2 4 1 6 7 8 **(D)** 5 3 1 2 4 7 6 8

i. The concatenation of two lists is to be performed in O(1) time. Which of the following implementations of a list could be used?

**(A)** Singly linked list **(B)** Doubly linked list
**(C)** Circular doubly linked list **(D)** Array implementation of list

j. Which of the following file organizations is preferred for secondary key processing?

**(A)** Indexed sequential file organization **(B)** Two-way linked list
**(C)** Inverted file organization **(D)** Sequential file organization

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

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**Q.2** a. Explain the following operators in C
(i) Increment and decrement operator
(ii) Bitwise operator
(iii) Size of operator **(9)**

b. What are the basic data types that C language supports? Give the size, range and use of each of them. **(7)**

**Q.3** a. Write a program to find whether a given year is a leap year or not.

b. Write a program to read the numbers until -1 is encountered. Also count the number of prime numbers and composite numbers entered by the user. **(8)**

**Q.4** a. What are the advantages and disadvantages of using call-by reference technique of passing arguments? **(8)**

b. Write a program / algorithm to merge two integer arrays. Also display the merged array in reverse order. **(8)**

**Q.5** a. Explain the following string manipulation functions :
(i) strcat function
(ii) strcmp function
(iii) strcpy function **(9)**

b. Write a program to count the number of lower case numbers, upper case numbers and special characters present in the contents of a file. (Assume that the file contains the following data: 1. Hello, How are you?) **(7)**

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**PART (B)**

**Answer at least any TWO Questions. Each question carries 16 marks.**

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**Q.6** a. Explain Bubble sort. Write an algorithm to sort an array A with N elements. **(8)**

b. Write a program in C that finds transpose of an input matrix. **(8)**

**Q.7** a. Write an algorithm to insert a new node at the end of a singly linked list. **(7)**

b. Convert the following infix expression into prefix expression.
(A+B) / C(C+D) – (D*E) **(5)**

c. When an element is added to the deque with n memory cells, what happens to LEFT or RIGHT? **(4)**

**Q.8** a. Suppose a binary tree T is in memory. Write a recursive procedure which finds the depth DEP of T. **(8)**

b. Write an algorithm for post order traversal of a binary tree. **(8)**

**Q.9** a. List and explain any four applications of graphs. **(4)**

b. What do you mean by spanning tree and minimum spanning tree? Explain giving a suitable example. **(4)**

c. Write an algorithm for DFS traversal. Give an example to justify. **(8)**