ROLL NO. _____

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

AMIETE – ET/CS/IT

Time: 3 Hours **JUNE 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 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.**

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

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

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.

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. **(8)**

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)**

PART (B)

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

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)**