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

AMIETE – ET/CS/IT (NEW SCHEME)

Time: 3 Hours   **JUNE 2012**   **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. What is the maximum number of nodes in a heap with 8 leaf nodes?

   (A) 15   **(B)** 16
   (C) 17   **(D)** 31

b. Considering the following program fragment, the correct values of a and c are:
```
main()
{ int a,b,c;
b=2;
a=2*(b++);
c=2*(++b);
}
```
   (A) a=4,c=6   **(B)** a=3,c=8
   (C) a=3,b=6   **(D)** a=4,c=8

c. The link of a linked list is

   (A) Unsigned integer   **(B)** Pointer to integer
   (C) Pointer to struct   **(D)** None of the above

d. A relational operator

   (A) assigns one operand to another   **(B)** yields a Boolean result
   (C) logically combines two operands   **(D)** none of the above

e. The node containing the minimum value in a binary search tree of integers must be

   (A) root node   **(B)** a node with empty right child
   (C) leaf node   **(D)** a node with empty left child

f. A collection of recursive functions is executed in a

(A) Last in first out order   **(B)** First in first out order
(C) Parallel fashion   **(D)** None of the above

g. Which is not a representation of graph?

(A) Adjacency matrix   **(B)** Edge list
(C) Adjacency list   **(D)** All represent a graph

h. C is the result of development process that started with an older language called

(A) Basic Programming Computer Language
(B) Basic Combined Programming Language
(C) Basic Computer Programming Language
(D) None of the above

i. For a linear search, the average number of comparison for a file with n records
is_____

(A) n/2   **(B)** n
(C) log 2n   **(D)** none of these

j. How many times will the following loop be executed?
```
            ch='b';
            while(ch>='a' && ch<='z')
            ch++;
```

(A) 0   **(B)** 25
(C) 26   **(D)** 1

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

Q.2 a. Differentiate the following:
   (i) Unary Operator and Binary Operator
   (ii) Local variables and Global variables
   (iii) & and &&   **(9)**

b. Write a note on type conversion and type casting in C.   **(7)**

Q.3 a. Write a C program, which accepts an integer number and prints the sum
of its digits.   **(8)**

b. While purchasing certain items a discount of 10% is offered if the quantity
purchased is more than 2000.Write a program to calculate the total expenses, if
quantity and price per item are entered through keyboard.   **(8)**

Q.4 a. What is a pointer? How can you use pointers with Array to copy the elements of one array to another? **(7)**

b. The nth Fibonacci number is defined by
1 if n is 1
1 if n is 2

The sum of the previous two Fibonacci numbers otherwise. Write a recursive function in C to compute the nth Fibonacci number. **(9)**

Q.5 a. Define a structure for a customer of a bank having name, an account number, an account type (which is a character) and the balance amount. Assume that 'allCustomers' is an array of customers. Write a C function to print the details of a customer, given an account number. **(8)**

b. Write a C program to reverse a substring within the main string. Pointers to the main string and the substring are passed as arguments to this function. **(8)**

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

Q.6 a. Write down the algorithm for quick sort. Under what circumstances would you not use quick sort? **(10)**

b. Construct a Minheap using the following names:
Tim,Dot,Eva,Roy,Tom,Kim,Guy,Amy,Jon,Aun,Jim,Kay,Ron,Jan **(6)**

Q.7 a. Consider a linked list to store a polynomial, that is, every node of the linked list has coefficient, exponent and pointer to the next node in the list.
(i) Define a structure for node of such a list.
(ii) Write a function to subtract two such polynomials. The function should accept pointers to the two polynomials as arguments and return the pointer to the resultant polynomial. Assume that the polynomials passed to the function are in decreasing order on the exponents. **(10)**

b. Evaluate the following postfix-expression using stack. Show the content of the stack in each step.
6 2 3 + − 3 8 2 / + * 2 $ 3 + **(6)**

Q.8 a. Draw a binary search tree (initially empty) that results from inserting the character of the word 'EASYQUESTION'. **(6)**

b. Write an algorithm to delete a node from a binary search tree. Delete the key Q from the binary search tree generated in (a) above and show the resultant tree. **(10)**

Q.9 a. Write a C function to create the adjacency list representation of a graph, given its adjacency matrix representation. **(8)**

b. What is a minimum spanning tree? Explain any algorithm for finding minimum cost spanning tree. **(8)**