ROLL NO. _____

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

AMIETE – ET/CS/IT

Time: 3 Hours **DECEMBER 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. A C program contains the following declarations and initial assignments:
int i=8, j=5;
Determine the value of the following expression. Use the values assigned to the variables for evaluating the expression.
2* ((i / 5) + (4 * (j – 3)) % (i + j) – 2)

(A) 20 **(B)** 18
(C) 14 **(D)** 16

b. How many nodes are there in the full tree of degree 3 and height 4?

(A) 20 **(B)** 121
(C) 100 **(D)** None of these

c. Consider the following code segment
int x=10, y=10, a, b;
int *p1=&x, *p2=&y;
a=*pl+ (*p2) - - ;
b= ++ (*p2) - *p1;
printf ("%d %d", a,b);
what will be its output?

(A) 10 0 **(B)** 20 0
(C) 0 20 **(D)** 0 10

d. What would be the output of the following C program?

```
struct   Emp
{    char name[20];  int age; float sal;
};
Emp e1= {"Amol", 21, 2345.00};
Emp e2= { "Ajay", 23, 4500.75};
void main()
{
Emp  & func( );
func(  )= e2;
```

```
printf ( "%s %d %f", e1.name, e1.age,e1.sal);
}
Emp &  func()
{
return  e1;
}
```

(A) Ajay 23 4500.75 **(B)** Amol 21 2345.00
(C) Error **(D)** None of these

e. The postfix expression for the infix expression A + B * (C + D) / F + D * E is
(A) AB + CD + * F/D + E * **(B)** A*B + CD / F*DE ++
(C) ABCD + * F/+DE * + **(D)** A+*BCD / F * DE ++

f. Evaluate the following prefix expression
- * 6 3 – 4 1
(A) 25 **(B)** 23
(C) 15 **(D)** 12

g. Let p be the queue of integers defined as follows:

```
#define    MAXQ    500
struct  queue
    {
            int items[MAXQ];
            int front, rear;
    } q;
```

To insert an element in the queue we can use

(A) ++q.items[q.rear]=x; **(B)** q.items[++q.rear] = x;
(C) q.items[++q.rear]++ = x; **(D)** None of these

h. Representing polynomial in memory using linked list requires each node having
(A) 3 fields **(B)** 4 fields
(C) > 4 **(D)** None of these

i. How many ancestors do a node in the N^{th} level (root level=0) of a binary search tree have?
(A) N **(B)** N+1
(C) 2^N **(D)** 2^{N+1}

j. Average case time complexity of the quicksort algorithm is more than
(A) O (N $\log_2$ N) **(B)** O(N^2 log N)
(C) O (N^2) **(D)** O (N^3)

PART (A)

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

Q.2 a. Explain with the help of an example how floating point numbers are stored. **(4)**

b. What do you understand by forced conversions? Explain with example. **(4)**

c. Differentiate between logical and arithmetic shift. **(4)**

d. Do the following conversions: **(4)**

(i) $(25)_8 = (?)_{16}$ (ii) $(A21)_{16} = (?)_{10}$

Q.3 a. Can any of the three initial expressions in the for statement be omitted? If so, what are the consequences of each omission? **(4)**

b. Write a program that will read a positive integer and print its binary equivalent. **(6)**

c. What is the output of the following program? **(2)**

```
const int a=124;
void main()
{
const int *sample();
int *p;
p=sample();
printf ( "%d",*p);
}
const int *sample()
{
return (&a);
}
```

d. Write a C program to reverse a given number. **(4)**

Q.4 a. Distinguish between the following: **(6)**

(i) int (*m)[5]; and int *m[5]

(ii) int (*ptr)(); and int *ptr()

b. Write a program to show how elements of an array can be accessed using pointers. **(6)**

c. With the help of an example show sequence of execution during function calls. **(4)**

Q.5 a. Write a program to copy the contents of one file into another file using command line arguments. **(6)**

b. How is a string stored in memory? Is there any difference between string and character array? Write a C program to copy one string to another using pointers and without using library functions. **(8)**

c. What is a bit field? Why are bit fields used with structures? **(2)**

PART (B)

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

Q.6 a. What is a heap? Write a C program to sort an array of integers using the heap sort method. Given: 6, 5, 3, 1, 8, 7, 2, 4 are elements of an array, show the different stages of sorting. **(8)**

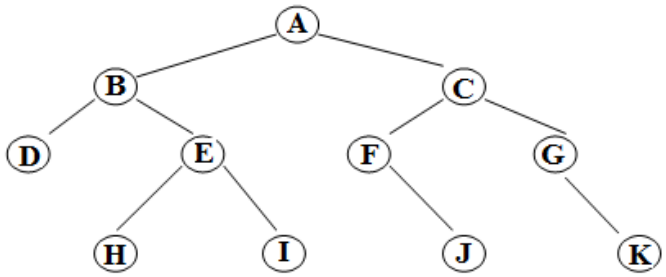
b. Write a C program to search for an element using binary search. **(8)**

Q.7 a. Write a C program to convert the given infix expression into its equivalent postfix form. **(6)**

b. Write a C program to implement the working of a queue of integers using an array. Provide the following operations.
(i) insert (ii) delete
(iii) display **(6)**

c. Write a C function to insert an element after a given node in a singly linked list. **(4)**

Q.8 a. Give the order of visitation of the binary tree shown in the following figure. **(6)**



(i) Preorder traversal (ii) Inorder traversal
(iii) Postorder traversal

b. Write an C function to insert an element into a binary search tree. **(5)**

c. Write a C function to search for an item in a binary search tree. **(5)**

Q.9 a. Write a C program for BFS traversal. Explain the same with the help of an example. **(10)**

b. Explain with the help of examples the following:
(i) Adjacency Matrix
(ii) Linked Adjacency Lists **(6)**