

Subject: C & DATA STRUCTURES**Time: 3 Hours****JUNE 2011****Max. Marks: 100****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. What would be the output of the following program?

```
main()
{
    printf("%c", "abcdefgh"[4]);
}
```

- (A) error (B) d
(C) e (D) abcdefgh

- b. In the following code

```
#include <stdio.h>
main()
{
    FILE *fp;
    fp = fopen("trial", "r");
}
fp points to:
```

- (A) The first character in the file
(B) A structure which contains a char pointer which points to the first character in the file
(C) The name of the file
(D) None of the above

- c. How many bytes would be allocated by the following code?

```
#include "alloc.h"
#define MAXROW 3
#define MAXCOL 4
main()
{
    int (*p) [MAXCOL] [MAXROW];
    p = (int(*) [MAXROW] [MAXCOL]) malloc(sizeof(*p));
}
```

- (A) 12 bytes (B) 14 bytes
(C) 10 bytes (D) 16 bytes

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

```
main()
{
    struct emp
```

```

{
char *n;
int age;
};
struct emp e1 = {"Dravid",23};
struct emp e2 = e1;
strupr (e2.n);
printf("\n%s", e1.n);
}

```

- (A) Dravid (B) Error
(C) DRAVID (D) None of these
- e. A linked list representation, a node contains at least
(A) node address field, data field
(B) node number, data field
(C) next address field, information field
(D) none of these
- f. Number of nodes in a complete binary tree of depth K is
(A) 2^K (B) $2K$
(C) $2^K - 1$ (D) none of the above
- g. The following sequence of operation is performed on a stack
push(1), push(2), pop, push(1), push(2), pop, pop, pop, push(2), pop.
The sequence of popped out values are
(A) 2,2,1,2,1 (B) 2,2,1,1,2
(C) 2,1,2,2,1 (D) 2,1,2,2,2
- h. The postfix expression for the infix expression $(A + (B \times C)) / (C - (D \times B))$ is
(A) $ABC \times CDB + \times - /$ (B) $ABC \times + / CDB \times -$
(C) $ABC \times + CDB \times - /$ (D) $ABC + C \times DB \times - /$
- i. What is the number of swaps required to sort 'n' elements using selection sort, in the worst case?
(A) $\theta(n)$ (B) $\theta(n \log n)$
(C) $\theta(n^2)$ (D) $\theta(n^2 \log n)$
- j. Which of the following data structure store the non-homogeneous data elements?
(A) Arrays (B) Records
(C) Pointers (D) none of these

PART (A)

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

Q.2 a. Write a note on type conversion and forced conversion. (4)

b. Write a C program to convert a given number of days into months and days. (6)

c. Do the following conversions:
(i) Hexadecimal to octal: $(3DE)_{16}$ (ii) Octal to Binary: $(13.54)_8$
(iii) Octal to Decimal: $(56)_8$ (2×3)

Q.3 a. Give the difference between
(i) ifelse and switchcase
(ii) while and do....while (2×3)

- b. Write a program using pointers to compute the sum of all elements stored in an array.
- c. What will be the output of following: (2×2)

```
(i) main()
{
    int i = -5;
    int j = -2;
    junk(i, &j);
    printf("i = %d j = %d", i, j);
}
junk(i, j)
int i, j;
{
    i = i * i;
    *j = *j**j;
}
```

```
(ii) main()
{
    int *c;
    c = check(10, 20);
    printf("c = %d", c);
}
check(i, j)
int i, j;
{
    int *p, *q;
    p = &i;
    q = &j;
    if(i >= 45)
        return(p);
    else
        return(q);
}
```

Q.4 a. What is recursion? Write a recursive function reverse(s), which reverses the string 's'. (2+6)

b. Define the following: (2×4)

- (i) extern (ii) calloc()
(iii) malloc() (iv) call by reference

Q.5 a. What is the difference between structures and unions? (4)

b. Explain giving suitable example the use of the unary operator *sizeof*. (3)

c. State the difference among three ways of assigning values to string variables. Give appropriate example.

- (i) char string [] = {"...."}; (ii) strcpy(string, "...");
(iii) scanf("%s", string); (6)

d. Write the output of the program:

```
main()
{
    struct s1
    {
        char *z;
        int i;
        struct s1 *p;
    };
    static struct s1 a[] = {
        {"Nagpur", 1, a+1},
        {"Raipur", 2, a+2},
        {"Kanpur", 3, a}
    };
};
```

```

    struct s1 *ptr = a;
    printf("%s %s %s\n", a[0].z, ptr → z, a[z].p → z);
}

```

(3)

PART (B)

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

- Q.6** a. What are the limitations of array data structures? How can it be avoided using linked lists? (6)
- b. Write a C program to merge two sorted arrays x and y containing n1 and n2 elements respectively. (5)
- c. Here is an array of 6 integers (unsorted):
 10 5 9 13 8 12
 Sort the list in ascending order using Bubble sort. Draw the array diagram for each iteration. (5)
- Q.7** a. Convert the given infix expression $((A + B) * C - (D - E) ^ (F + G))$ to equivalent prefix and postfix notations. (6)
- b. Write the pseudo code that check for balanced parentheses in an algebraic expression. (4)
- c. Write a program to delete a specific node from a linked list. (6)
- Q.8** a. Draw a binary tree for the expression: $A * B - (C + D) * (P/Q)$ (4)
- b. Write a 'C' program to demonstrate the various types of binary tree traversals? (8)
- c. What is a binary search tree? Give a suitable example. (4)
- Q.9** a. Explain using an example what is the in degree and out degree of a node? How an adjacency matrix is used for finding the in degree and out degree of node i? (6)
- b. Write the algorithm for the depth first traversal. Explain the same with the help of an example. (6)
- c. What is a minimum spanning tree? Convert the given graph with weighted edges to minimal spanning tree. (1+3)

