

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

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**PART (A)**

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

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- 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) if .....else and switch .....case  
(ii) while and do....while (2×3)

b. Write a program using pointers to compute the sum of all elements stored in an array. (6)

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

