

**Computer Science I Back paper Exam**  
**Dec 2015**  
**Indian Statistical Institute**

**Part I Answer any 15 of the following - 2x15 = 30 marks**

1. The CPP command ..... is used to access the functions 'printf' and 'scanf'
2. In a C program, '\n' is used to print a ..... character
3. Negative numbers are represented in binary form in ..... notation
4. In a C program, the declaration  
    int \*iptr;  
    makes iptr an .....
5. To store the value 5 / 9 in a variable, declare the variable as a ..... data type
6. Reversing a string is best done using the ..... data structure.
7. A 2x2 matrix can be implemented in C using ..... arrays.
8. Consider char x = 'a'; printf( "%d", x) will print ..... value of 'a'.
9. There are two ways in which one can call a function, pass by ..... and pass by .....
10. A function that calls itself is called a ..... function.
11. The Head of a linked list should point to the ..... element in the list
12. Consider the code  
    union test  
    {  
        unsigned int x;  
        unsigned char y;  
        int z;  
    };  
    sizeof(test) on a computer with int size 4 would yield .....
13. int i = 2; printf (" %d ", ++i) will print .....
14. A binary tree has at the most ..... children
15. The two's complement of the number -3 is .....
16. The declaration  
    Struct date {  
        unsigned int day: 5;  
        unsigned int month: 4;  
        unsigned int year;  
    };  
    is an example of using ..... in a C program.
17. The function fputs() can be used to ..... to a file
18. Arithmetic expressions are converted to ..... form before they are processed by computers.

**Part II Answer the following as True or False - 2x5 = 10 marks**

1. Consider the following code

```
FILE *fp;  
  
fp = fopen("fileio.txt", "w+");
```

fp is a file pointer that is opened in the 'read-only' mode.

2. A global variable is defined inside the main() function of a program  
3. First-in-first-out is an example of a Queue data structure  
4. Consider the code

```
int x = 10, y = 20;  
int *ip = &x;  
printf("%d\n", *ip)
```

The above will print 20

5. A linked list 'l1ist' with pointers l1ist->prev and l1ist->next is an example of a doubly linked list.

**Part III Answer the following - 4x5 = 20 marks**

1. For example, converting the expression  $2 + 3$  to postfix form would yield  $2\ 3\ +$ . Using the same principle to convert the following expressions to postfix form.

- a.  $x - y$   
b.  $x*y + u*v$

2. Declare a struct for a node on a doubly linked list that holds an integer data value.  
3. Declare a Union consisting of two variables of type int and char.  
4. Declare a function pointer for a function that takes one char argument and returns an int value.  
5. Consider the code

```
int i =10, j=0;  
do {  
    j+=2;  
} while (j < i)
```

How many times will the for loop execute?

**Part IV Answer any 4 of the following - 5x4 = 20 marks**

1. Write a function that checks if a string is a palindrome  
2. Write a program that declares a pointer to an integer 'iptr'. Allocate memory such that iptr is able to hold an array of 100 integers.  
3. Write a function that takes two integer values p and c that represent values of a parent and child in a heap respectively. Write a function that returns 0 if this is a MAX heap and 1 if its a MIN heap.  
4. Show in steps the process of inserting a value 85 into a MAX heap 100, 90, 80, 70,60, 50, 20, 45, 17, 18, 30, 26.  
5. Consider the following program:

```

#include <stdio.h>
int x = 100;
void testscope() {
    int i = 70;
    printf("function scope %d \nglobal scope %d \n", i, x);
}
int main(void) {
    // your code goes here
    int i = 10, x = 50;
    printf("main scope %d \nglobal scope %d \n", i, x);
    testscope();
    if (i) {
        int i = 50;
        printf("block scope %d \nglobal scope %d \n", i, x);
    }
    return 0;
}

```

Provide the output of the above program

**Part V Answer any one: - 4x5 = 20 marks each**

1. Declare a stack using an array or a linked list

Write functions that perform the following operations on the stack:

- a. creates the stack
- b. push a value on to the stack
- c. pop from the stack
- d. checks if the stack is empty

2. Write a program that does the following:

- a. Declares a file pointer and opens the file
- b. Reads five lines of input from the keyboard one at a time in a loop
- c. For each line read count, the number of characters input
- d. For each line that is read, write the line to the file and at the end of the line, write the character count.
- e. Once all five lines have been written to the file, close the file

3. Write a program to that does the following:

1. Declares two 2x3 matrices
2. Defines functions that
  - a. adds the matrices
  - b. Subtracts the matrices
  - c. Transposes the matrices
  - d. Prints the diagonal of the matrices