

CSED, MNNIT Allahabad, Prayagraj, India
MCA I Semester, End Semester Examination, December 2018
Programming and Problem Solving (CS31101)

Time: Three Hours

Total Marks: 60

Note: Paper is printed on both sides. Questions carry equal weight. Read questions carefully. Understand a question before you start writing. Feel free to assume any missing data but categorically mention it under the heading 'Assumptions for this question'. Solving a problem correctly is necessary, but not sufficient, as it does not guarantee the maximum marks allotted for the problem. Sufficient credit is reserved in each case for smart algorithm, presentation, and good coding practice.

1. Answer the following

- a) Your clothes are dirty and you want to put them in the washing machine. You put the temperature at 50 C° and set the cycle at "coloured cottons"; you satisfy yourself that you don't have a full load, so you press the "half-load" button; finally, you start the washing cycle. Is this a program? Further, suppose your friend tells you to "do the washing, please". Is this a program? Justify your answers.
- b) Are the rules of chess (or any other two/multi player game) a programming language? Justify your answer.

2. What is printed in the following with reason(s) for the answer given, presume necessary header files and/or other code.

- a) `void main() {
 int i=7;
 printf("%d",i++*i++);
}`
- b) `#define one 0
#ifdef one
 printf("one is defined");
#ifndef one
 printf("one is not defined");
}`
- c) `main() {
 static int i=3;
 printf("%d",i--);
 return i>0? main():0;
}`
- d) `void main() {
 int x=7;
 while (x==1) x=x-1;
 printf("%d",x);
}`
- e) `#define FOO(x,y) { printf(" %d ",y); x = y; }
int main(int argc, char**argv) {
 int a = 2;
 int b = 3;
 FOO(a,++b); FOO(a,++b);
 return 0;
}`
- f) `void foo(int x, int y) { printf(" %d ",y); x = y; }
int main(int argc, char**argv) {
 int a = 2;
 int b = 3;
 foo(a,++b); foo(a,++b);
 return 0;
}`

3(a) A decimal number between 0 and 32 exclusive can be expressed in binary system as $x_4x_3x_2x_1x_0$, where x_i 's are either zero or one. Write a C program that accepts (from the terminal) a decimal number in the above range and prints out the equivalent binary representation. For example if the decimal is 17, then the program should print 10001. The program must also print an error message if the input is outside the range.

3(b). Write a C program that calculates the sum of digits of an integer.

4. A point in a two-dimensional coordinate system can be represented by an x and a y coordinate. Define a structure point which represents such a point. Write a function points_equal() which takes as parameters two points and returns true if they are identical and false if they are not. Further, a rectangle in a two-dimensional coordinate system can be represented by two points: the lower left corner and the upper right corner. Define a structure rectangle which represents as two points, using the point structure then write a function rectangles_equal() which takes as parameters two rectangles and returns true if they are identical and false if they are not. Finally, write a program which lets users to check the functionality of above structures and functions.

5. Write programs for **any three** of the following with appropriate comments:

- Reads a string and prints the number of characters in it.
- Reads a string and prints it vertically on the console
- Reads a string and sets all vowels equal to a space.
- Reads a string and computes the frequency of lower case letters in it.

6. Write C code to create singly linked list for five of your friends containing their name and age as information. What changes one needs to do in node structure to make it useful for doubly linked list?

7. Loops are very important constructs in the programming and problem solving. Explain each of these with their utility by writing C or C++ example code.

8. Divide and conquer is a very famous strategy for solving bigger software problems. How functions help in C programming environment in using and implementing above strategy? Explain in detail what precautions a programmer must take when using functions in a C program for solving a problem.

9. Write one statement each explaining any 24 C++ key words of your choice.

10. Write down an expression for (a) x is a positive odd number (b) x is a positive number not divisible by 10 (c) y is a legitimate month number (d) y is not a legitimate month number (e) y is a leap year in the 17th century (f) x is less than -2000 or greater than or equal to 40 (g) x is not a year in this century (h) x is a day number representing Tuesday or Saturday, in a C++ program and to check for their validity.

Declaration

I am here to learn. I value Examination Ethics and practice it.

Signature

Name and Registration No.