

C 01
CSED, MNNIT Allahabad, Allahabad, India
PhD & MCA I Semester, End Semester Examination, November 2017
Programming and Problem Solving (CA3101)

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'.

1. Answer the following parts. Marks of individual parts are given in the end.

a) Identify two syntax errors and one semantic error in the function `foo()` below, which tries to print an integer, along with its square and cube. Clearly identify which errors are syntax errors, and which one is the semantic error, and show the corrections that should be made. (02)

```
int foo(int n) { int n2, int n3; /* This function is busted
n2 = n * n; n3 = n2 * n2; printf("n=%d, n^2 = %d, n^3 = %d\n", n, n2, n3);
return 0; }
```

b) What does `mystery(6)` print to the stdout? Further, give a short, high-level description of what the `mystery()` function does. (01)

```
void mystery(int i) { if (i) { mystery(i/2); putchar('0' + (i % 2)); } }
```

c) What output does this fragment of code produce? (01)

```
#define FORMAT "%s is a string"
```

```
printf(FORMAT, FORMAT);
```

d) What does the following code print to stdout? (01)

```
printf("%d\n", ((~3) ^ (~1)) + (4 >> 1));
```

e) Suppose that you call `scanf("%f%d%f", &x, &i, &y)` where `x` and `y` are float variables and `i` is an int. If the user enters 12.3 45.6 789, what will be the values of `x`, `i`, and `y` after the call? (01)

2. Answer the following with reason(s) for the answer given, presume necessary header files.

a) Let `i`, `j` be integer variables. What is the value printed after the following loop?

```
for (i=j=0; i<10; ++i) { j = i + j; ++i; } printf("%d\n", j);
```

b) Let `i`, `j`, `s` be integer variables. What is the value of `s` printed after the following outer loop?

```
s = i = 0; while (i < 10) { j = 0;
while (j < 5) { if (i != j) ++s; ++j; }
++i; }
printf("%d\n", s);
```

c) Let the function `f` be defined as follows:

```
int f ( int n ) { int t; t = 100000 * ( n % 10 ) + ( n / 10 ); return t / n; }
```

What is the value returned by the call `f(142857)`?

d) Let the function `g` be defined as follows:

```
int g ( int n ) { if ( n < 2 ) return n; return g(n/2); }
```

What is the value returned by the call `g(142857)`?

e) What is the value printed by the following program?

```
int h ( int a , int b ) { a = b - a; return b - a; }
```

```
int main ()
```

```
{ int a = 9, b = 2; a = h(a,b); b = h(a,b); printf("%d\n", a); }
```

f) What is the output of the following program?

```
int n = 10; void fgh ( int r ) { printf("%d,%d\n",n,r); }
```

```
int main () { int n = 20; fgh(n); }
```

3(a). Write a program which prints the whole numbers between `A` and `B` where values for `A` and `B` are read in from command line (command prompt).

3(b). Write a program which prints the perimeter of a rectangle. The sides should be composed of asterisks (*). Its length should contain 35 and its width 20 asterisks.

4. Do any **two** of the following using C++ programming language syntax

a) Write a program to discover how many terms of the following series have to be added together for the sum to exceed a total as provided by the user:
 $1 + 4 + 9 + 16 + 25 + 36 + \dots$

b) Goods in a warehouse are marked with a code number and a price. If the code number is 200 or less, then GST is not charged on the article; otherwise a charge of 10% is added.

Write a program to print out the total cost of a number of goods purchased and the GST charged.

The data provided by the user consists of pairs of numbers, the first representing the code number of the article and the second its cost. Data input is terminated by two negative numbers.

c) Write a program to print the first N rows of the following table of values:

1 4 7 10 13

2 5 8 11 14

3 6 9 12 15

The value of N is to be provided as command line argument

5. Write functions for any **two** of the following:

a) Return the cube of an integer x (x multiplied by itself three times).

b) Convert lower case letters to capitals.

c) Return a boolean value which states that a given day number, month number and year number form a valid date.

Write programs to test the **two** functions chosen by you.

6. Explain the working of any two sorting algorithms along with corresponding C code.

7. Write C program which holds data for the students crediting the subject Programming and Problem Solving (CA3101). The student information includes name, registration number and date of birth. Demonstrate management of this data either in an array based stack or in a linked list.

8. Compare and contrast ease of programming and problem solving using either C or C++. The narration should involve a minimum of 12 aspects for comparison

9. Write names of **12 Linux** commands and provide a brief of 25 words for each of these.

10. Write any **24 keywords**, common to both C and C++ programming languages, along with a two sentence explanation for each of these 24 keywords.

Declaration

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

Signature

Name and Registration No.