

B.C.S.E 1st Year 2nd Semester Examination 2018
Introduction to Computer Programming

Time: **Three hours**Full Marks: **100**

All questions carry equal marks of 20 but Question# 1 & 4 are compulsory

All programs must be well commented

Many-part questions have equal division and must be answered in one place

1. a) Write a program to display $\sin(x)/x$ for $0 \leq x \leq 4 * \text{PI}$ with horizontal x-axis.
 b) Write a program for the sequence guessing game 1, 3, 6, 10, 15, 21, 28, 36, 45, 55,...

2. Write a main program that acquires a dynamic array of integers of some size, fills it with random integers in a given range, prints it, looks for a user-given integer in the array with linear search, sorts it with insertion sort and then again looks for a user-given integer with binary search; all using user-defined functions. Also, write all these functions integrated with the main program.

3. a) The output produced by the following program is a 3 b 2 c 2. Why?

```
#include <stdio.h>
int f(int i) {return ++i;}
int g(int &i) {return ++i;}
int h(char &i) {return ++i;}
main(){
    int a=0, b=0, c=0;
    a+=f(g(a));
    b+=g(f(b));
    c+=f(h(c));
    printf("a %d b %d c %d\n", a, b, c);
}
```

 b) Write a program to find the largest, smallest, mean and standard deviation of a set of numbers without using an array.

4. There is a straight line with numbered positions from 0 to N. A walker starts at one of these positions and steps forward or backward one position at a time. The probability of a forward step is P and of a backward step, therefore, is 1 – P (for example, P = 1 / 4 means only a quarter of the steps are forward). A walk ends when position 0 or N is reached. Simulate such walks to determine how often each of these end positions is reached. This is a random walk problem. Write a program to simulate the walk.

5. a) Given the declarations

```
char c; const char cc='a'; char *pc; const char *pcc; char *const cpc=&c;
```

[Turn Over

const char *const cpc=&cc; char *const *pcpc;
which of the following assignments are legal, which are illegal and why?
c=cc; cc=c; pcc=&c; pcc=&cc; pc=&c; pc=&cc; pc=pcc; pc=cpc;
pc=cpc; cpc=pc; *cpc=*pc; pc=*pcpc; **pcpc=*pc; *pc=**pcpc;
b) Write a program to find the value of $\sin(x)$ with 10^{-4} accuracy..

6. a) Write a program to implement the complex data type. This means create the appropriate data types and functions for all valid operations on complex numbers.
b) Write a program to calculate and display the binary equivalent of a positive number.
 7. a) Take an approximation of a different kind. Let $\text{new}(x) = 1 + 1 / \text{old}(x)$ with $x = 1$ to start so that applying it over and over, we get 2, 1.5, ... Is the convergence fast or slow? How does it compare with the Golden ratio?.
b) Write a program to find the 4th root of a number but do justify the method.
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