Oct 9/2008

19/19

Question 1 – 5 marks

[1 mark] a) Convert the number 483 from base 10 to base 2. → 111100011 → $1\times2^8+1\times2^7+1\times2^6+1\times2^5+1\times2^1+1\times2^0$

483
- 256
227
- 128
99
- 64
35
- 32
3

256	128	64	32	16	8	4	2	1
1	1	1	1	0	0	0	1	1

✓

[1 mark] b) Convert the number 1011101 from base 2 to base 10. → 93

$1\times2^6+0\times2^5+1\times2^4+1\times2^3+1\times2^2+0\times2^1+1\times2^0$

$64+16+8+4+1=93$ ✓

64
+16
80
88
92
93

5/

[1 mark] c) Show all possible binary values that can be represented using 3 bits.

000	110
001	111
010	
011	
100	
101	

✓

[2 marks] d) Given you answer to part c, how can we represent negative integers using 3 bits? What impact does this have on the largest positive value that can be represented compared to unsigned integers?

- we can represent negative integers by using signed int, and letting the first number say the sign (0=+, 1=-)
- the largest possible value would then be 011=3, compared to 111=7 in unsigned integers

✓

Question 2 – 3 marks

Given the following declarations and initializations, what is the result of evaluating the following expressions.

```
int     x = 19;
float   z = 32.0;
```

[1 mark] a) `x / 2`

19/2 == 9 ✓

[1 mark] b) `x % 3`

19%3 == 1 ✓

[1 mark] d) `x && z`

=1 ✓

int k = x && z

k = 1

>0

if(x){

//

}

x>0, z>0

if(x && z){

Question 3 – 2 marks

Your instructor told you that is very difficult, if not impossible, to prove non-trivial programs are correct. What are some of the difficulties involved in determining if a program is correct or not?

- difficulties can include the fact that to prove that a non-trivial program was correct you would have to test it for every possible value, which is an unreasonable expectation ✓

Question 4 – 4 marks

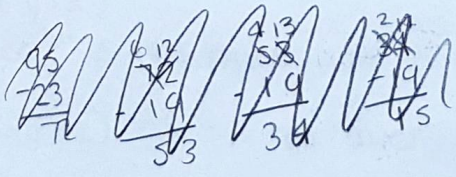
Trace the following program to determine its output. You must trace the program as shown in class. If you just write the output you will lose marks.

```
#include <iostream>

using namespace std;

int main()
{
        int     x;
        int     y;
        int     z;

        x = 14; y = 13; z = 95;

        while ( z > 0)
        {
                cout << x << " " << y << " " << z << endl;
                if (x % 3)
                {
                        x = x - 1;
                }

                if (y > 9)
                {
                        y = y - 3;
                }
                z = z - (x+y);
        }
}
```

main
x: 7 14 13 12
y: 7 13 10 7
z: 7 95 72 53 34 15 -4

output
14 13 95
13 10 72
12 7 53
12 7 34
12 7 15

/ 4/



Question 5 – 5 marks

Write a complete program that inputs 3 floating point values using `cin` and then outputs the minimum, maximum and average value using `cout`.

```
#include <iostream>
using namespace std;

int main()
{ float x;
  float y;
  float z;
  cout<<"Input first value"<<endl;
  cin>>x;
  cout<<"Input second value"<<endl;
  cin>>y;
  cout<<"Input third value"<<endl;
  cin>>z;
if (x<z && x<y)
{cout<<x<<" is the minimum"<<endl;}
if (z<x && z<y)
{cout<<z<<" is the minimum"<<endl;}
if (y<x && y<z)
{cout<<y<<" is the minimum"<<endl;}
if (x>z && x>y)
{cout<<x<<" is the maximum"<<endl;}
if (z>x && z>y)
{cout<<z<<" is the maximum"<<endl;}
if (y>x && y>z)
{cout<<y<<" is the maximum"<<endl;}
cout<<(x+y+z)/3<<" is the average value"<<endl;
}
```

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