GNG 1106

Fundamentals of Engineering Computation

Assignment 2 – Fall 2016

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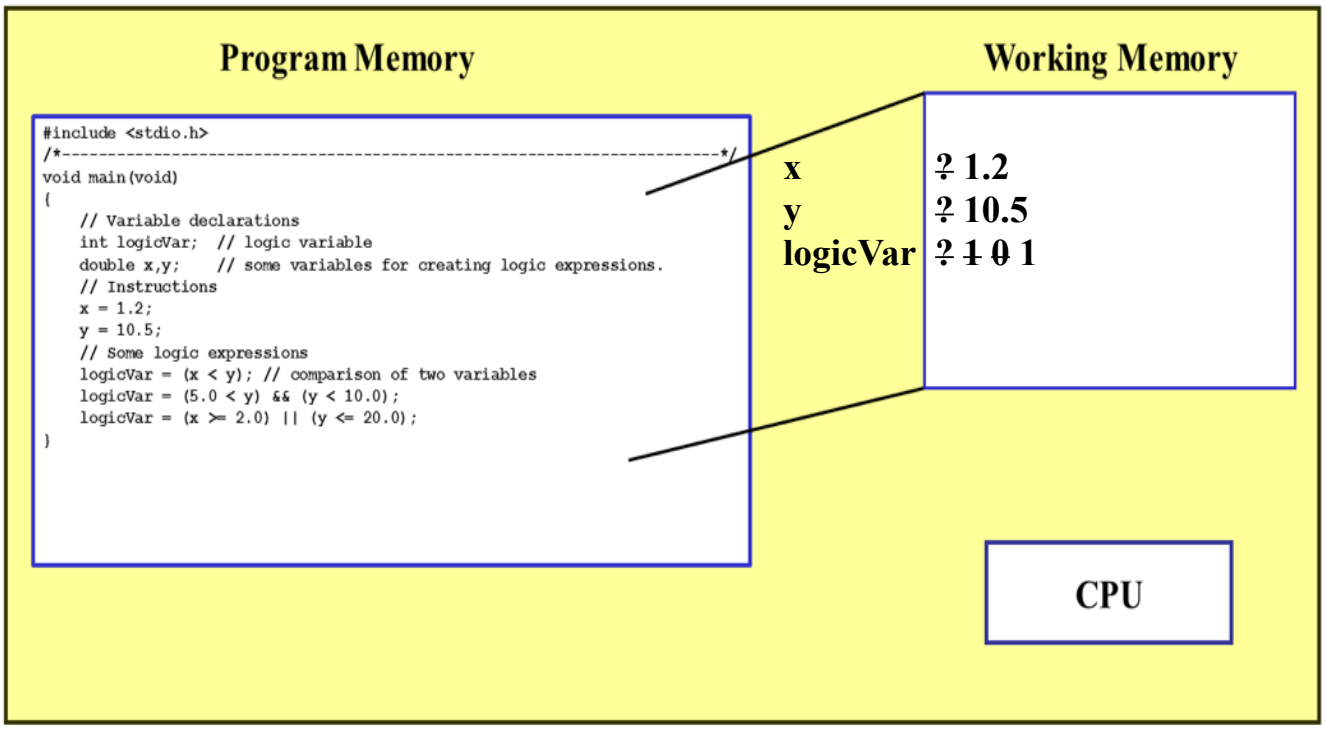
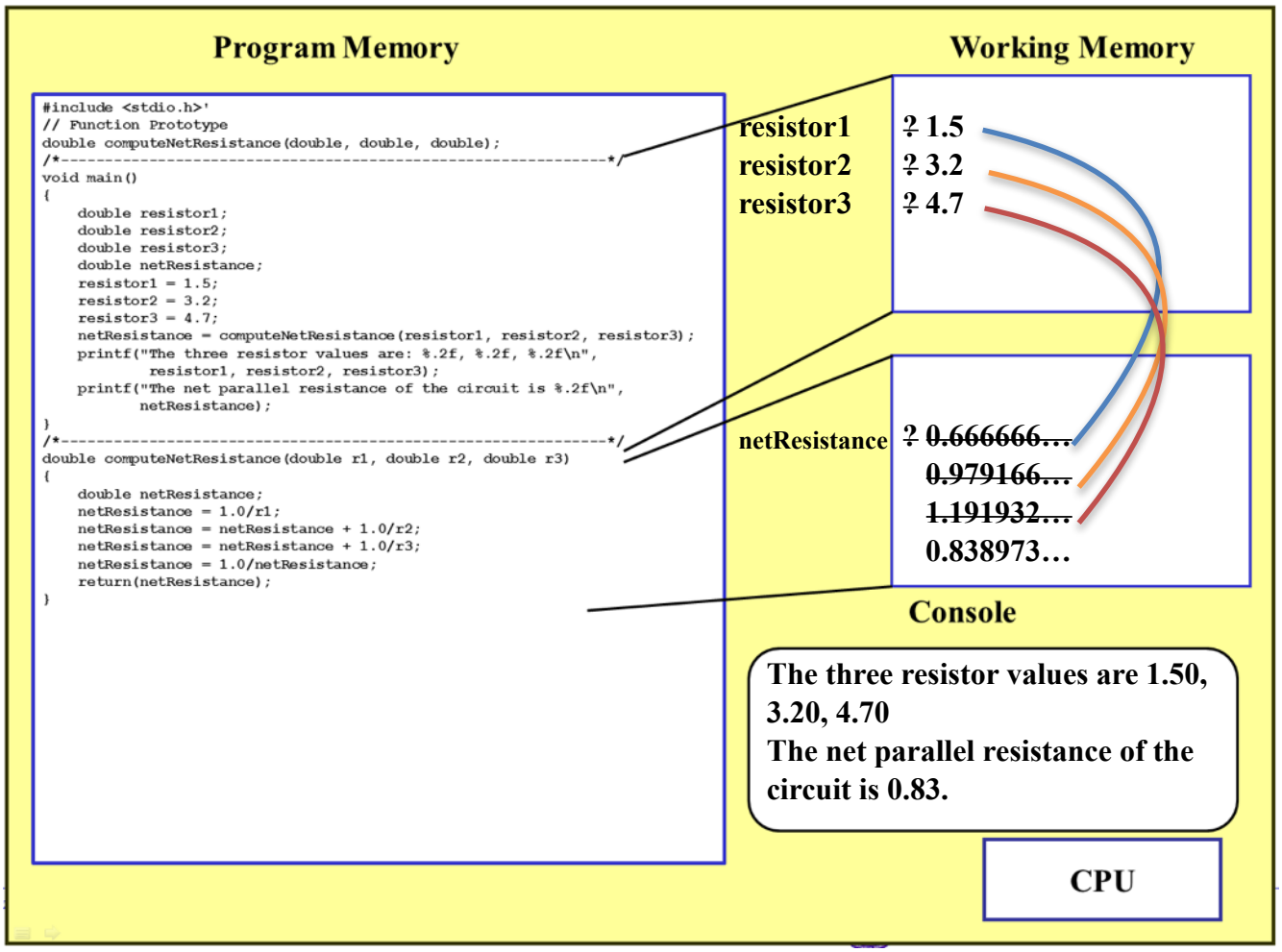
Question 1:

(a)


Program Memory
Working Memory
#include <stdio.h>
/*----------*/
void main(void)
{
// Variable declarations
int logicVar; // logic variable
double x,y; // some variables for creating logic expressions.
// Instructions
x = 1.2;
y = 10.5;
// Some logic expressions
logicVar = (x < y); // comparison of two variables
logicVar = (5.0 < y) && (y < 10.0);
logicVar = (x >= 2.0) || (y <= 20.0);
}
x
y
logicVar
? 1.2
? 10.5
? 1 0 1
CPU

(b)


Program Memory
Working Memory
#include <stdio.h>'
// Function Prototype
double computeNetResistance(double, double, double);
/*--*/
void main()
{
double resistor1;
double resistor2;
double resistor3;
double netResistance;
resistor1 = 1.5;
resistor2 = 3.2;
resistor3 = 4.7;
netResistance = computeNetResistance(resistor1, resistor2, resistor3);
printf("The three resistor values are: %.2f, %.2f, %.2f\n",
resistor1, resistor2, resistor3);
printf("The net parallel resistance of the circuit is %.2f\n",
netResistance);
}
/*--*/
double computeNetResistance(double r1, double r2, double r3)
{
double netResistance;
netResistance = 1.0/r1;
netResistance = netResistance + 1.0/r2;
netResistance = netResistance + 1.0/r3;
netResistance = 1.0/netResistance;
return(netResistance);
}
resistor1
resistor2
resistor3
? 1.5
? 3.2
? 4.7
netResistance
? 0.666666…
0.979166…
1.191932…
0.838973…
Console
The three resistor values are 1.50, 3.20, 4.70
The net parallel resistance of the circuit is 0.83.
CPU

Question 2:

Written code:

```
/*---------------------------------

File: A2_AngleDetermination

Author: Menat Allah Taleb (8622127)

Description: This program calculates the mainimum and maximum angles required to launch an object to a specific altitude +/- 2%

 ____________________________________*/

#include <stdio.h>

//Math header

#include <math.h>

//symbolic constant for R and Ve

#define R 6371

#define Ve 11.2

//function protypes

double anglemax(double,double);

double anglemin (double,double);

/*--------------------------------

Function: main

Description: This function asks the user for the initial velocity and desired altitude then saves those values to be used to calculate the required angles. It then calls upon the “anglemax" and “anglemin” functions and it displays the output of the calculation.

 --------------------------------*/

void main()

{

   double iv,altitude, finalmax, finalmin;

   printf("Please enter the initial velocity in km/s: \n ");

   scanf ("%lf", &iv);
```

```
    printf("Please enter the desired altitude in km: \n");

    scanf("%lf", &altitude);

    finalmax = anglemax (iv, altitude);

    finalmin = anglemin (iv,altitude);

    printf("For initial velocity %lf km/s and desired altitude %lf km +/-2 percent . The departure angle must be between %lf and %lf", iv, altitude, finalmin, finalmax);

}

/*---------------------------------

 Function: anglemax

 Description: This function uses the input from the main function to calculate the required maximum angle using the minimum altitude. It then stores the values till it is called upon by the main function.

 Parameter: initial velocity, altitude`

 Return: The maximum angle

 ---------------------------------*/

double anglemax (double iv, double altitude)

{

    double anglehigh, alphalow;

    //Min altitude is used to compute high angle

    //calculations for highest angle

    alphalow = ((altitude / 1.02)/R); //calculating alpha

    anglehigh = (Ve/iv);//calculating (ve/v0)

    anglehigh = pow (anglehigh,2); //calculating (ve/v0)^2

    anglehigh = anglehigh * ((alphalow/(alphalow +1))); //Calculating (a/a+1)*(ve/vo)^2

    anglehigh = sqrt (1-anglehigh); //square rooting: 1-[(a/a+1)*(ve/vo)^2]

    anglehigh = asin((1 + alphalow)*anglehigh); //finding arcsine

    anglehigh = anglehigh * (180/ M_PI); // converting the angle from degrees to radians

    return (anglehigh);

}
```

```
/*---------------------------------

 Function: anglemin

 Description: This function uses the input from the main function to calculate the required minimum angle using the maximum altitude. It then stores the values till it is called upon by the main function.

 Parameter: initial velocity, altitude`

 Return: The minimum angle

 ---------------------------------*/

   double anglemin (double iv, double altitude)

   {

      double anglelow, alphahigh;

      //Max altitude is used to compute low angle.

   //calculations for lowest angle

   alphahigh = ((altitude * 1.02)/R);

   anglelow = (Ve/iv);//calculating (ve/v0)

   anglelow = pow (anglelow,2); //calculating (ve/v0)^2

   anglelow = anglelow * ((alphahigh/(alphahigh +1))); //Calculating (a/a+1)*(ve/vo)^2

   anglelow = sqrt (1-anglelow); //square rooting: 1-[(a/a+1)*(ve/vo)^2]

   anglelow = asin((1 + alphahigh)*anglelow); //finding arcsine

   anglelow  = anglelow * (180/ M_PI); // converting the angle from degrees to radians

   return (anglelow);

}
```

Output:

Test case 1:

Please enter the initial velocity in km/s:

5.5

Please enter the desired altitude in km:

1000

For initial velocity 5.500000 km/s and desired altitude 1000.000000 km +/-2 percent . The departure angle must be between 49.350635 and 50.483990

Program ended with exit code: 145

Test Case 2:

Please enter the initial velocity in km/s:

6.5

Please enter the desired altitude in km:

2100

For initial velocity 6.500000 km/s and desired altitude 2100.000000 km +/-2 percent . The departure angle must be between 42.224999 and 43.925066

Program ended with exit code: 145

Test case 3:

Please enter the initial velocity in km/s:

7.5

Please enter the desired altitude in km:

3800

For initial velocity 7.500000 km/s and desired altitude 3800.000000 km +/-2 percent . The departure angle must be between 39.510235 and 41.835235

Program ended with exit code: 145

Test case 4:

Please enter the initial velocity in km/s:

8.4

Please enter the desired altitude in km:

5200

For initial velocity 8.400000 km/s and desired altitude 5200.000000 km +/-2 percent . The departure angle must be between 53.484807 and 55.537886

Program ended with exit code: 145