



Brac University

Department of Electrical & Electronic Engineering

EEE103 Project

EEE Pocket Tool– A Multi-Functional Circuit Assistant in C

Section 02

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Project Title: EEE Pocket Tool– A Multi-Functional Circuit Assistant in C

Objectives:

To ease the daily necessary calculations of circuits for students or professionals of Electrical Engineering, this program is a user-friendly, console-based C application that allows users to select from a set of tools based on their needs. Each tool will prompt for the required inputs and provide relevant electrical outputs in a structured and readable format. This loop based program makes it usable for multiple calculations recurrently. In particular, the series parallel equivalent resistance calculation is loop based as we need to measure the equivalent resistance of each segment of a circuit as either series or parallel, users can do it with continuous loop until they provide the ‘No’ command to continue.

Code:

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

float series(int n, float r[]){ // function for calculating equivalent
resistor in series
    float Rs = 0;

    printf("Enter the resistor values (in ohm): ");

    for (int i = 0; i < n; i++){
        scanf("%f", &r[i]);
        Rs += r[i];
    }

    return Rs;
}

float parallel(int n, float r[]){ // function for calculating equivalent
resistor in parallel
    printf("Enter the resistor values (in ohm): ");
    scanf("%f", &r[0]);
    float Rp = r[0];

    for (int i = 1; i < n; i++){
        scanf("%f", &r[i]);
        Rp = (Rp*r[i]) / (Rp+r[i]);
    }

    return Rp;
}
```

```

    }

    return Rp;
}

int power(int x, int n){ // calculates power of 10 for resistor
multiplier calculation
    int pwr = 1;

    for (int i = 0; i < n; i++){
        pwr *= x;
    }

    return pwr;
}

void resistor(){ // function to find the resistance of a resistor based
on it's color
    char color[12][10] = {"Black", "Brown", "Red", "Orange", "Yellow",
                          "Green", "Blue", "Violet", "Gray", "White",
                          "Gold", "Silver"};

    char color1[10], color2[10], multiplier[10];
    double resistance;

    printf("===== Resistor Value Determiner =====\n");

    printf("Band color list: ");
    for(int i = 0; i < 12; i++){
        printf("%s", color[i]);
        if(i<11){printf(", ");}
    }
    printf("\n");

    printf("Enter the color of the first band: ");
    scanf("%s", &color1);

    printf("Enter the color of the second band: ");
    scanf("%s", &color2);

    printf("Enter the color of the multiplier band: ");
    scanf("%s", &multiplier);

    int i, j, k;

    for(i = 0; i<=9; i++){

```

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        int first = strcmp(color1, color[i]);
        if (first == 0){break;}
    }

    for (j = 0; j<=9; j++){
        int second = strcmp(color2, color[j]);
        if (second == 0){break;}
    }

    for (k = 0; k<12; k++){
        int mult = strcmp(multiplier, color[k]);
        if (mult == 0){break;}
    }

    if (k <= 9){
        resistance = ((10 * i) + j) * power(10, k);
    } else if(k == 10){
        resistance = ((10 * i) + j) * 0.1;
    } else {
        resistance = ((10 * i) + j) * 0.01;
    }

    printf("Your resistance value is: %g ohm\n\n", resistance);
}

void eqResistance (){ //calculated equivalent resistance using other two
functions - series and parallel function
    printf("===== Equivalent Resistance Calculator =====\n");

    char type;
    int n;
    float eqRes = 0;

    printf("Enter the values by each segment of series or parallel for
easier calculation: \n");

    char go = 'y';

    while (go == 'y'){ //using series and parallel function repeatedly
        printf("\nSegment type - Series(s) or Parallel(p): ");
        scanf(" %c", &type);

        if (type == 's'){
            printf("\nEnter the number of resistor in series: ");
            scanf("%d", &n);

```

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        float Rseries[n];

        printf("\nEquivalent resistance in series: %g\n", series(n,
Rseries));
    } else {
        printf("\nEnter the number of resistor in parallel: ");
        scanf("%d", &n);

        float Rparallel[n];

        printf("\nEquivalent resistance in series: %g\n",
parallel(n, Rparallel));
    }

    printf("Continue? Yes(y) or No(n):");
    scanf(" %c", &go);
}
printf("\n");
}

void voltageDivide(){ //finds output voltage or resistance for expected
output voltage
    printf("===== Voltage Divider =====\n");

    printf("\nCircuit Diagram: Vin_____\n");
    printf("                         |\n");
    printf("                         R1 ! 1\n");
    printf("                         |\n");
    printf("                         \\\n");
    printf("                         /\n");
    printf("                         \\\n");
    printf("                         /\n");
    printf("                         \\\n--- Vout\n");
    printf("                         /\n");
    printf("                         \\\n");
    printf("                         /\n");
    printf("                         \\\n");
    printf("                         /\n");
    printf("                         |\n");
    printf("                         R2 ! 3\n");
    printf("                         ___|\n");
    printf("                         ___\n");
    printf("                         _\n");

    printf("\nChoose one option:\na. Output voltage determiner\nb.
Resistance calculation for desired output\n");

```

```

char option;

printf("\nOption a or b: ");
scanf(" %c", &option);

float Vin, R1, R2, Vout;

if (option == 'a'){
    printf("\nEnter the input voltage value (Vin): ");
    scanf("%f", &Vin);

    printf("Enter first resistor value (R1): ");
    scanf("%f", &R1);

    printf("Enter second resistor value (R2): ");
    scanf("%f", &R2);

    Vout = (Vin * R2) / (R1 + R2);

    printf("\nOutput voltage: %g\n\n", Vout);
} else if (option == 'b'){
    printf("\nEnter the input voltage value (Vin): ");
    scanf("%f", &Vin);

    printf("Enter first resistor value (R1): ");
    scanf("%f", &R1);

    printf("Enter the expected output voltage (Vout): ");
    scanf("%f", &Vout);

    while (Vout > Vin){
        printf("Output voltage must be less than input voltage:
\n");
        printf("Output voltage (Vout): ");
        scanf("%f", &Vout);
    }

    R2 = (R1 * Vout) / (Vin - Vout);
    printf("\nResistor value based on your given voltage output:
%g\n\n", R2);
}
}

int main()
{

```

```

int choice;
while (1){ // program will run before user chooses to exit
    printf(" _____\n");
    printf("| EEE Pocket Tool |\n");
    printf("|\n");
    printf("1. Series Circuit Solver\n");
    printf("2. Parallel Circuit Solver\n");
    printf("3. Resistor Value Determiner\n");
    printf("4. Equivalent Resistance Calculator\n");
    printf("5. Voltage Divider Calculator\n");
    printf("0. Exit\n");

    printf("Enter your choice: \n");
    scanf("%d", &choice);

    switch (choice){
        case 1:{
            float Vs, Rs;
            int n;

            printf("===== Series Circuit Solver =====\n");

            printf("Enter the value of voltage source (in V): ");
            scanf("%f", &Vs);

            printf("Enter the number of resistor in series: ");
            scanf("%d", &n);

            float r[n];

            Rs = series(n, r);

            printf("\nEquivalent resistance = %g ohm\n", Rs);

            printf("\nCurrent flowing though the circuit = %g A\n",
(Vs/Rs));

            printf("\nVoltage drop through each resistor:\n\n");

            for (int i = 0; i < n; i++){
                printf("R%d: %g ohm resistor = %g V\n", (i+1), r[i],
((Vs/Rs)*r[i]));
            }
            printf("\n");
        }
    }
}

```

```

        break;

    case 2:{
        float Vs, Rp;
        int n;

        printf("===== Parallel Circuit Solver =====\n");

        printf("Enter the value of voltage source (in V): ");
        scanf("%f", &Vs);

        printf("Enter the number of resistor in parallel: ");
        scanf("%d", &n);

        float r[n];

        Rp = parallel(n, r);

        printf("\nEquivalent resistance = %g ohm\n", Rp);

        printf("\nTotal Current = %g A\n", (Vs/Rp));

        printf("\nCurrent through each resistor:\n\n");

        for (int i = 0; i < n; i++){
            printf("R%d: %g ohm resistor = %g A\n", (i+1), r[i],
(Vs/r[i]));
        }
        printf("\n");
    }
    break;
case 3:
    resistor();
    break;
case 4:
    eqResistance();
    break;
case 5:
    voltageDivide();
    break;
case 0:
    printf("Shutting down...");
    return 0;
default:
    printf("Please enter a valid choice from the list.\n");
}

```

```
    }  
}
```

Results:

1. Series circuit solver function:

```
|-----|  
| EEE Pocket Tool |  
|-----|  
  
1. Series Circuit Solver  
2. Parallel Circuit Solver  
3. Resistor Value Determiner  
4. Equivalent Resistance Calculator  
5. Voltage Divider Calculator  
0. Exit  
Enter your choice:  
1  
===== Series Circuit Solver =====  
Enter the value of voltage source (in V): 20  
Enter the number of resistor in series: 5  
Enter the resistor values (in ohm): 1  
2  
3  
4  
5  
  
Equivalent resistance = 15 ohm  
  
Current flowing though the circuit = 1.33333 A  
  
Voltage drop through each resistor:  
  
R1: 1 ohm resistor = 1.33333 V  
R2: 2 ohm resistor = 2.66667 V  
R3: 3 ohm resistor = 4 V  
R4: 4 ohm resistor = 5.33333 V  
R5: 5 ohm resistor = 6.66667 V  
  
|-----|  
| EEE Pocket Tool |  
|-----|  
  
1. Series Circuit Solver  
2. Parallel Circuit Solver  
3. Resistor Value Determiner  
4. Equivalent Resistance Calculator  
5. Voltage Divider Calculator  
0. Exit  
Enter your choice:
```

2. Parallel circuit solver function:

```
|-----|  
|      EEE Pocket Tool      |  
|-----|  
  
1. Series Circuit Solver  
2. Parallel Circuit Solver  
3. Resistor Value Determiner  
4. Equivalent Resistance Calculator  
5. Voltage Divider Calculator  
0. Exit  
Enter your choice:  
2  
===== Parallel Circuit Solver =====  
Enter the value of voltage source (in V): 10  
Enter the number of resistor in parallel: 5  
Enter the resistor values (in ohm): 2 4 6 8 10  
  
Equivalent resistance = 0.875912 ohm  
  
Total Current = 11.4167 A  
  
Current through each resistor:  
  
R1: 2 ohm resistor = 5 A  
R2: 4 ohm resistor = 2.5 A  
R3: 6 ohm resistor = 1.66667 A  
R4: 8 ohm resistor = 1.25 A  
R5: 10 ohm resistor = 1 A  
  
|-----|  
|      EEE Pocket Tool      |  
|-----|  
  
1. Series Circuit Solver  
2. Parallel Circuit Solver  
3. Resistor Value Determiner  
4. Equivalent Resistance Calculator  
5. Voltage Divider Calculator  
0. Exit  
Enter your choice:  
|
```

3. Resistor value determiner function:

```
|-----|  
| EEE Pocket Tool |  
|-----|  
1. Series Circuit Solver  
2. Parallel Circuit Solver  
3. Resistor Value Determiner  
4. Equivalent Resistance Calculator  
5. Voltage Divider Calculator  
0. Exit  
Enter your choice:  
3  
===== Resistor Value Determiner =====  
Band color list: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White, Gold, Silver  
Enter the color of the first band: Red  
Enter the color of the second band: Orange  
Enter the color of the multiplier band: Yellow  
Your resistance value is: 230000 ohm  
  
|-----|  
| EEE Pocket Tool |  
|-----|  
1. Series Circuit Solver  
2. Parallel Circuit Solver  
3. Resistor Value Determiner  
4. Equivalent Resistance Calculator  
5. Voltage Divider Calculator  
0. Exit  
Enter your choice:  
|
```

4. Equivalent resistance calculator function:

```
|-----|  
| EEE Pocket Tool |  
|-----|  
1. Series Circuit Solver  
2. Parallel Circuit Solver  
3. Resistor Value Determiner  
4. Equivalent Resistance Calculator  
5. Voltage Divider Calculator  
0. Exit  
Enter your choice:  
4  
===== Equivalent Resistance Calculator =====  
Enter the values by each segment of series or parallel for easier calculation:  
Segment type - Series(s) or Parallel(p): s  
Enter the number of resistor in series: 3  
Enter the resistor values (in ohm): 5 10 15  
Equivalent resistance in series: 30  
Continue? Yes(y) or No(n):y  
Segment type - Series(s) or Parallel(p): p  
Enter the number of resistor in parallel: 4  
Enter the resistor values (in ohm): 1 2 3 4  
Equivalent resistance in series: 0.48  
Continue? Yes(y) or No(n):n  
  
|-----|  
| EEE Pocket Tool |  
|-----|  
1. Series Circuit Solver  
2. Parallel Circuit Solver  
3. Resistor Value Determiner  
4. Equivalent Resistance Calculator  
5. Voltage Divider Calculator  
0. Exit  
Enter your choice:  
|
```

5. Voltage divider calculator function:

EEE Pocket Tool

1. Series Circuit Solver
2. Parallel Circuit Solver
3. Resistor Value Determiner
4. Equivalent Resistance Calculator
5. Voltage Divider Calculator
0. Exit

Enter your choice:

5

===== Voltage Divider =====

Circuit Diagram: Vin ---

Choose one option:

- a. Output voltage determiner
- b. Resistance calculation for desired output

Option a or b: a

Enter the input voltage value (Vin): 10

Enter first resistor value (R1): 15

Enter second resistor value (R2): 25

Output voltage: 6.25

EEE Pocket Tool

1. Series Circuit Solver
2. Parallel Circuit Solver
3. Resistor Value Determiner
4. Equivalent Resistance Calculator
5. Voltage Divider Calculator
0. Exit

Enter your choice:

6. Exiting from the program:

```
|-----|  
|      EEE Pocket Tool      |  
|-----|  
  
1. Series Circuit Solver  
2. Parallel Circuit Solver  
3. Resistor Value Determiner  
4. Equivalent Resistance Calculator  
5. Voltage Divider Calculator  
0. Exit  
Enter your choice:  
0  
Shutting down...  
Process returned 0 (0x0)  execution time : 224.467 s  
Press any key to continue.  
|
```