Total Marks: 60 Time: 2.5 Hours

[Answer any four (4) of the following Questions.]

1. (a) Find the range in which a resistor having the following color bands must exist to satisfy the manufacturer's tolerance: 3

1st resistor:	green	blue	orange	gold
2nd resistor:	red	red	brown	silver

(b) A stereo system draws 2.5A at 120V. The audio output power is 150W. How much power is lost in the form of heat in the system? What is the efficiency of the system? 4

(c) A 10Ω resistor is connected across a 15-V battery. 4

i. How many joules of energy will it dissipate in 1 minute?

ii. If the resistor is left connected for 2 minutes instead of 1 minute, will the energy used increase? Will the power dissipation level increase?

(d) Determine the current I and the voltage V_1 for the network of Figure 1. 4

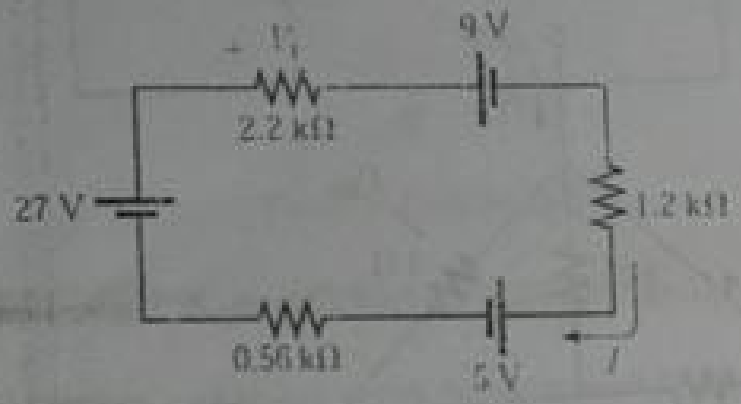

Figure 1: Problem 1(d)

2. (a) Find I, V_3, R_3 and V_2 from the circuit of Figure 2. 6

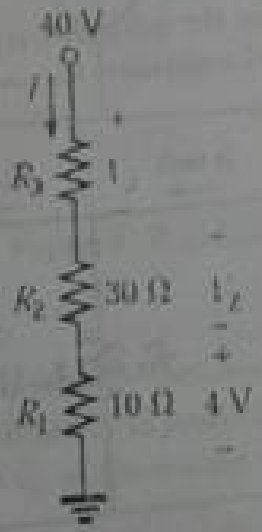

Figure 2: Problem 2(a)

(c) A horizontal spring is found to be stretched 2 cm from its equilibrium position when a force of 50 gram acts on it. Again 100 gram body is attached to the end of the spring and it is pulled 5 cm along a horizontal frictionless table from the equilibrium position. The body is then released and executes simple harmonic motion. Find out the following parameters:

- What is the force constant of the spring?
- What is the force exerted by the spring on the 100 gram body just before it is released?
- What is the period of oscillation after release?

4. (a) What is coherence light source? How it can be achieved?

(b) Prove that the fringe width for a double slit interference mechanism is

$$\beta = \frac{\lambda D}{d}$$

where β = fringe width, D = distance between slit and screen and d = slit distance.

(c) State and explain Brewster's law.

(d) Write a short note about Michelson Interferometer.

5. (a) Find the mass of an electron whose velocity is $0.99\,c$, where $c = 3 \times 10^8 ms^{-1}$.

(b) What are the postulates of special theory of relativity? What is an inertial frame of reference?

(c) What is time dilation? Defend the statement "a moving clock ticks more slowly than a clock at rest".

6. (a) State the 2nd law of thermodynamics.

(b) Show that the efficiency of a Carnot's engine is $\eta = 1 - \frac{T_2}{T_1}$, where T_1 and T_2 are the temperatures of the source and the sink respectively.

(c) Define isobaric and isochoric process with proper figure.

mathematically that, the area of the positive pulse of a sine wave is 2I_m.

(c) Find the phase relationship between the waveforms of each of the

i. $v = 0.2 \sin(\omega t - 60°)$
$i = 0.1 \sin(\omega t + 20°)$

ii. $v = 1 \sin(\omega t + 50°)$
$i = 6 \sin(\omega t + 10°)$

iii. $v = 200 \sin(\omega t - 210°)$
$i = 25 \sin(\omega t - 60°)$

6 (a) State the Maximum Power Transfer Theorem for ac network.

(b) Find the Norton's equivalent circuit for the network of Figure 10.

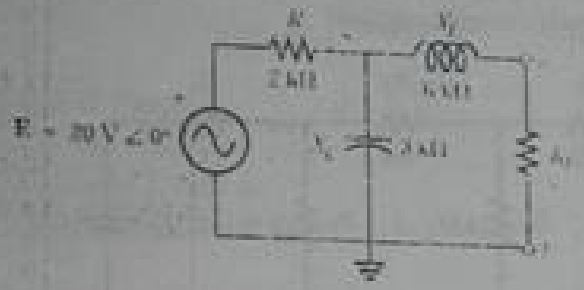

Figure 10: Problem 6(b)

(c) Using the Δ-Y or Y-Δ conversion, find the current i from Figure 11.

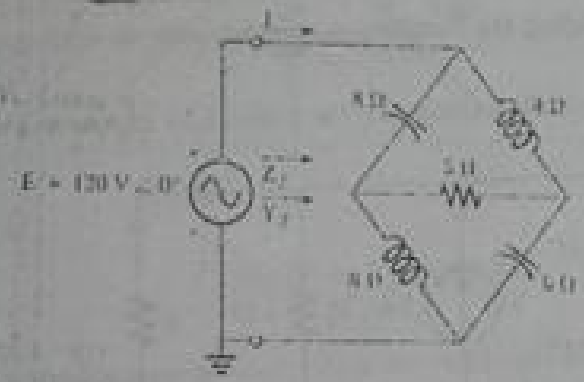

Figure 11: Problem 6(c)

(d) Write the mesh equations for the circuit of Figure 12

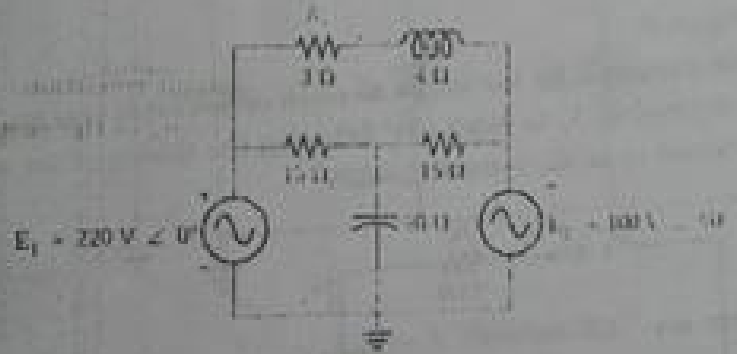

Figure 12: Problem 6(d)

University of Dhaka
Department of Computer Science and Engineering
1st Year 1st Semester B.Sc. Examination 2011
PHY - 1122 : Physics

Total Marks: 60 Time: 2.5 Hours

[Answer any four (4) of the following Questions.]

1. (a) Mention how Miller index is set for any plane of a crystal structure. 4
   (b) Mention and explain different kinds of defects in a crystal structure with proper diagram. 5
   (c) Define angle of contact. Find out a general expression for pressure inside a liquid drop. 2+4

2. (a) Show that the potential at a point r distance away from a point charge is as follows: 5
$$V = \frac{q}{4\pi\varepsilon_0 r}$$
   (b) Express the current equation for an RC circuit when it is in charging phase. 5
   (c) What is form factor? Prove that r.m.s. voltage of an AC signal is 5
$$V_{r.m.s} = \frac{V_{max}}{\sqrt{2}}$$

3. (a) Find out the general solution of a damped system when it is in critical damping condition. 5
   (b) Prove that an object moving in a simple harmonic way has the total energy of $E =$ 5

(c) What is structured programming? Discuss using an example C program.

(d) Write a C program that will take a floating point positive number as input and prints that number as rounded to the nearest integer. To accomplish this you should not use any trick of format specifiers of `printf()` function [e.g., `printf("%.0f",val);`]. Please look at the sample input and output below:

Sample Input	Sample output
5.67	6
5.47	5

4. (a) Suppose you have declared a two dimensional array using the declaration statement `double M[514][97]`. If the memory address of the first byte of the declared array is 1000, then calculate the memory addresses of three elements: (i) M[50][50], (ii) M[513][96] and (iii) M[4][1]. *Consider Row-Major ordering in memory allocation of two dimensional arrays.*

(b) What do you understand by infinite loop? When do you need an infinite loop? Discuss with an appropriate example.

(c) Write the differences between

i. *unsigned int* and *int*

ii. An array of characters and a string

(d) Write a C program that takes two string inputs and replaces all occurrences of the letter X in the first string with the second string.

(e) Write a C program that prints the second maximum of an array of 100 integers.

5. (a) Explain *call by value* and *call by reference* in C using examples.

(b) i. What do you understand by a recursive function?

ii. What are the important properties that a recursive function must have?

iii. Write a recursive function in C that tests if its two integer arguments are relatively prime (x and y are relatively prime if they have no common divisor except 1). Use additional parameters for your function if required.

(c) What do you understand by prototypes of function? Why is it necessary?

(d) Write a C function that accepts a $N \times 5$ two-dimensional floating-point array and its row size N as the second argument and returns the average of the values of the array.

6. (a) What are the differences between user-defined data types and built-in data types? In C, how you define new data types and use them? Explain with appropriate examples.

(b) Distinguish between a macro and a function. Define a macro and a function to compute minimum of two arguments.

(c) What do you understand by storage classes of variables (static, auto, extern, register)? Describe each of them using appropriate examples.

(d) Describe how you will allocate an N-element float array dynamically, then take N floating point numbers from the user and compute and print standard deviation of the given numbers. What additional benefits are provided by the dynamic memory allocation as compared to static memory allocation? [For your information:

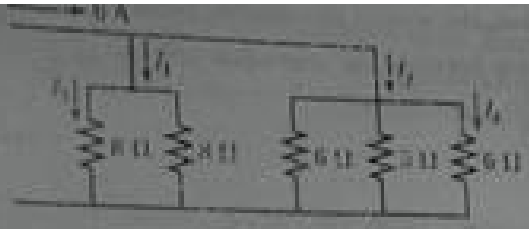

Figure 6: Problem 3(b)

(c) For the network of Figure 7: 5

i. Find the current I_3 using mesh analysis

ii. Based on the results of part (i), how would you compare the application of mesh analysis to the branch current method?

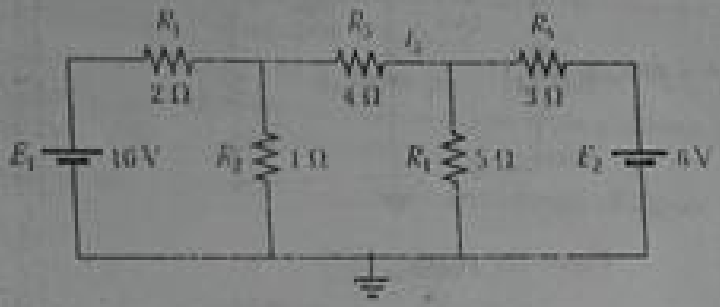

Figure 7: Problem 3(c)

4. (a) Mention the steps of finding the Norton's equivalent network with appropriate example. 4

(b) Find the Thevenin's equivalent circuit for the network in Figure 8 across R. 5

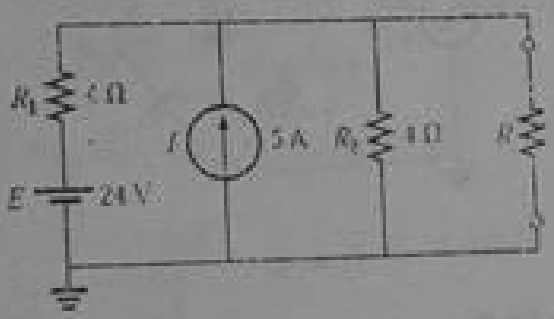

Figure 8: Problem 4(b)

6

(c) For the circuit of Figure 9:

i. Calculate the time required for the circuit to reach open circuit condition.

ii. Find the time required for V_c to reach 60V following the closing of the switch.

iii. Calculate the current i_C at the instant V_c=60V

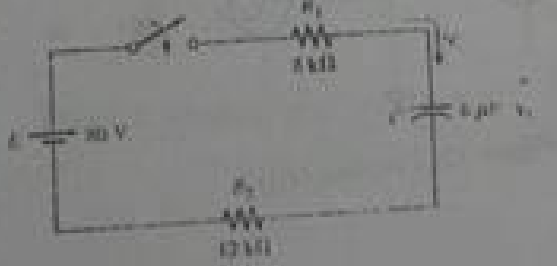

Figure 9: Problem 4(c)

[Answer any four (4) of the following Questions.]

1. (a) Discuss the classification of computers on the basis of size and capacity.
   (b) Describe the capabilities and limitations of computers.
   (c) Clearly describe the impact of computerization on modern society.
   (d) Differentiate between data and information.

2. (a) Draw a block diagram of a digital computer. Explain how the CPU and memory work together.
   (b) Briefly discuss the bus architecture of a digital computer.
   (c) What is generation of computers? Explain different generations of computers.
   (d) How is a PC different from a workstation? Explain the different types of portable computers.

3. (a) What is the benefit of using 'QWERTY' layout keyboard? What are the different types of mice used in a computer system?
   (b) What is the difference between DCE and DME?
   (c) Define resolution and refresh rate of a monitor. To display an image with 640 x 480 resolution with 8 bit colors, how many bytes must be sent from the computer to the monitor?
   (d) What are the advantages and disadvantages of CRT and LCD monitors?
   (e) Compare dot matrix, ink jet and laser printers in terms of performance.

4. (a) Draw the memory hierarchy based on the capacity, cost per bit and access time.
   (b) Mention the difference between SRAM and DRAM.
   (c) Compare hard disk and magnetic tapes in terms of advantages and disadvantages.
   (d) Define the parameters for measuring the performance of a hard disk?
   (e) What is the purpose of using cache memory? What is the difference between CD-R and CD-RW?

5. (a) Briefly discuss the different types of system software with examples. Compare compiler and interpreter.
   (b) What is operating system? Explain the major functions of operating system.
   (c) What is programming language? Distinguish between machine language and high level language.
   (d) Explain the features of Linux and MS-DOS. Compare multitasking and multiprocessing operating systems.
   (e) Define the application software with examples. Mention the characteristics of application software.
   (f) Briefly discuss the basic concepts of database.

6. (a) Describe the different topologies of a LAN network.
   (b) What is computer network? Explain the main features of different Internet services.
   (c) What is e-mail? Distinguish between LAN and WAN.
   (d) Define the bandwidth with examples. Discuss the features of different transmission media of a network.
   (e) What is WWW? Explain the necessities of network protocols.

the following program does not produce correct answers. Find out and correct logical errors from the program. (Try to alter the code minimum as possible):

```
#include<stdio.h>
int isArmstrong(int x){
    int c;
    int p = x;
    while(x!=0){
        c += (x%10);
        s += c;
        x /= 10;
    }
    if(s==p)
        return p;
    else
        return 0;
}
int main(){
    int A, B, i, sum;
    scanf("%d%d",&A,&B);
    for(i = 0; i<B; i++){
        sum += isArmstrong(i);
    }
    printf("Sum = %d\n",sum);
}
```

(b) An insurance company follows following rules to calculate premium:

i. If a person's health is excellent and the person is between 25 and 35 years of age and lives in a city and is a male then the premium is 5 taka per thousand and the policy amount can not exceed 2 lakhs.

ii. If a person satisfies all the above conditions except that she is a female then the premium is 4 taka per thousand her policy amount can not exceed 1 lakh.

iii. If a person's health is poor and the person is between 25 and 35 years of age and lives in a village and is a male then the premium is 6 taka per thousand and his policy can not exceed 10000 taka.

iv. In all the other cases, the person is not insured.

Write a C program that will take from user a person's age, gender, health condition and living address (whether village or city), then output whether the person should be insured or not. If he is insured, then print his/her premium rate and maximum amount for which (s)he can be insured.

(b) Determine the unknown resistance of Figure 3 if $R_1 = 5R_2$ and $R_3 = \frac{1}{2}R_2$.

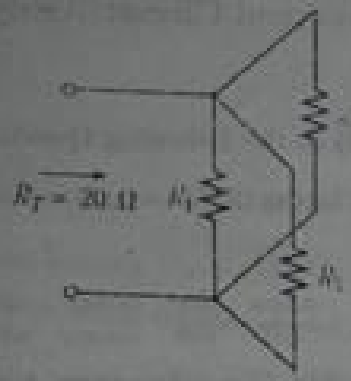

Figure 3: Problem 2(b)

(c) For the network of Figure 4:

i. Find the total resistance;

ii. Find the current I_1 and I_2;

iii. Find the power dissipated by the 4-ohm resistor.

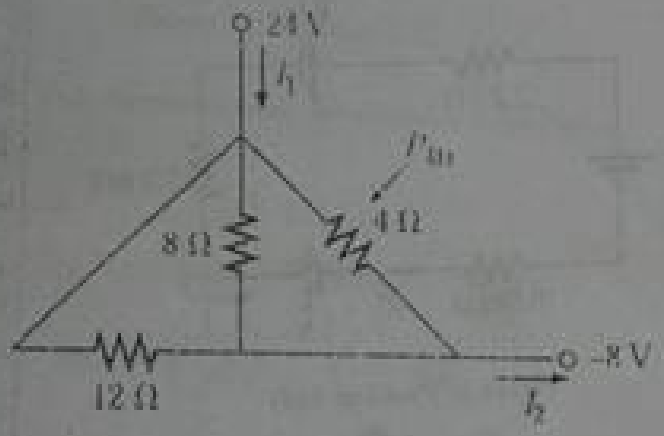

Figure 4: Problem 2(c)

3. (a) State Kirchhoff's current law. Using the information provided in Figure 5, find the branch resistors R_1 and R_3, the total resistance R_T and the voltage source E.

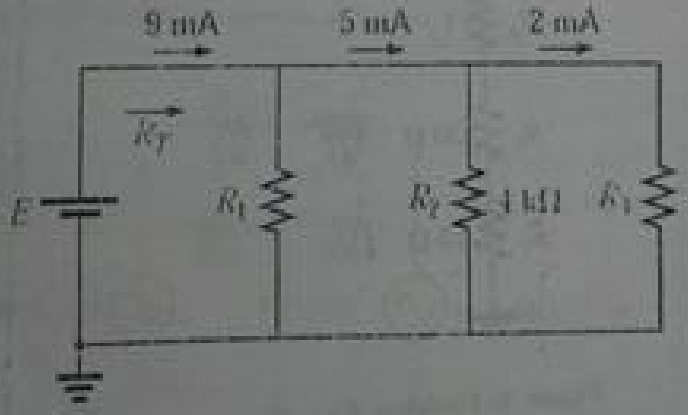

Figure 5: Problem 3(a)

the following:

```
1 2 3 4 5
4 3 2 1
1 2 3
2 1
1
```

2. (a) Write a C program that will print results according to the number given as input

Sample input for number N	Sample output
5	1 2 3 4 5 2 3 4 5 1 3 4 5 1 2 4 5 1 2 3 5 1 2 3 4

(b) Improve the following code fragment by choosing efficient constructs.

```
1 int i;
2 char ch, str[100];
3 i = 0;
4 while(scanf("%c",&ch)==1){
5     if(ch != '\n' && ch != '\t'){ str[i++]=ch; continue; }
6     if(ch == '\n') break;
7     if(ch == '\t') ch = ' ';
8     str[i++] = ch;
9 }
```

(c) Assume that you are given two text files named *first.txt* and *second.txt*. Write a C program that copies the content of *first.txt* and pastes it into *second.txt* before its original content.

(d) Consider the following C program. List all the syntax errors of the source code.

```
1  #include<studio.h>
2  #include<mathematics.h>
3
4  int main(){
5      double v1, v2;
6      char str[100], ch;
7      scanf("%d%d%s%c",v1,v2,&str,&ch);
8      if(v1 >> v2 || sqrt(v1) < 100)){
9          printf("Mark 1);
10     }else if{
11         printf(Mark 2)
12     }
13     return 0;
14 }
```

(a) The following C code fragment is supposed to print the sum of all **Armstrong numbers** between A and B (inclusive), where A and B are integers taken from user. For your information: *If sum of cubes of each digit of the number is equal to the number itself, then the number is called an Armstrong number. For example, 153 = (1*1*1)+(5*5*5)+(3*3*3), thus 153 is an Armstrong number.* But unfortunately, the following program does not produce correct answers. Find out and correct logical errors from the program. (Try to alter the code minimum as possible):

```
1  #include<stdio.h>
2  int isArmstrong(int x){
```

University of Dhaka

Department of Computer Science and Engineering

1st Year 1st Semester B.Sc. Examination 2011

CSE - 1102 : Programming Fundamentals

Total Marks: 60 Time: 2.5 Hours

[Answer any four (4) of the following Questions.]

1. (a) Using Compiler perspective, write short notes on the following topics. 2 * 3 = 6

   i. Preprocessor

   ii. Object code

   iii. Loader

   (b) What is the output of the following C code snippet.

```
1 int x, y, z;
2 x = 2; y = 1; z = 0;
3 x = x && y || z; printf("%d\n",x);
4 printf("%d\n", x || !y && x);
5 x = y = 1;
6 z = x ++ - 1; printf("%d\t%d\n",x,z);
7 z += - x ++ + ++ y; printf("%d\t%d\t%d\n",x,z,y);
8 x = 3 * 4 % 5 / - 2 * 4 * 12; printf("%d\n",x);
```

   (c) Write a program that takes an integer input n. It then prints n lines. The first line shows numbers 1 through n, separated by spaces (i.e. 1 2 3 ... n). The second line shows numbers (n-1) through 1, separated by spaces (i.e. n-1, n-2, ... 1). Continue up to the nth line which prints a 1. For example, for n=5, the output will look like the following:

   1 2 3 4 5

Semester B.Sc. Examination 2011

EEE - 1121 : Electrical Circuit Analysis

Total Marks: 60

Time: 2.5 Hours

[Answer any four (4) of the following Questions.]

1. (a) Find the range in which a resistor having the following color bands must exist to satisfy the manufacturer's tolerance: 3

1st resistor:	green	blue	orange	gold
2nd resistor:	red	red	brown	silver

(b) A stereo system draws 2.5A at 120V. The audio output power is 150W. How much power is lost in the form of heat in the system? What is the efficiency of the system? 4

(c) A 10Ω resistor is connected across a 15-V battery. 4

i. How many joules of energy will it dissipate in 1 minute?

ii. If the resistor is left connected for 2 minutes instead of 1 minute, will the energy used increase? Will the power dissipation level increase?

(d) Determine the current I and the voltage V_1 for the network of Figure 1. 1

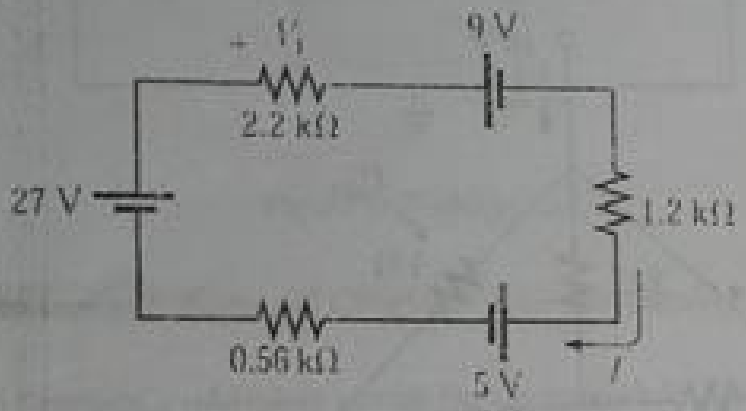

Figure 1: Problem 1(d)

2. (a) Find I, V_3, R_3 and V_2 from the circuit of Figure 2. 6

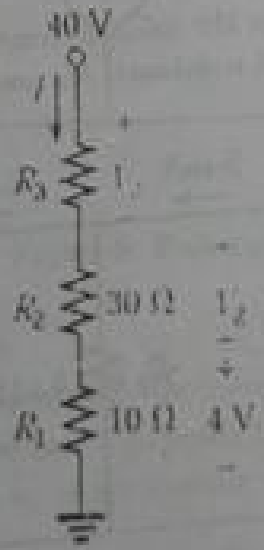

Figure 2: Problem 2(a)