b) What is the output of the following C program?

```
#include<stdio.h>
#define max 10
main()
{       int i;
        for(i=1; i<=max; i++)
        printf("%d/2= %.2f\n", i, i/2.0);
        printf("\n");
}
```

Question [3]: (40 marks)

a) Draw a flowchart, write an algorithm and writ a C program to find the factorial of a given number N.

b) Draw a flowchart, write an algorithm and write a C program to find the sum of numbers from 1 to N.

c) Write a C program to get the result of the multiplication of two matrices A, B:

$$A=\begin{bmatrix}1 & 2 & 3\\ -1 & 0 & 3\\ 7 & 4 & 1\end{bmatrix} \quad and \quad B=\begin{bmatrix}3 & 1 & 3\\ -1 & 0 & -2\\ 0 & 4 & 1\end{bmatrix}$$

d) Write a C program that sorts the elements of an array in ascending order using the selection sort method.

e) Write a C program to enter N random values between 0 and 100 and get their mean μ and the standard deviation sd where:

$$\mu=\frac{\sum_{i=0}^{N}X_i}{N},\quad sd=\frac{\sum_{i=0}^{N-1}(X_i-\mu)^2}{N-1}$$

Kafrelsheikh University		Date: 20/1/2016
Faculty of Engineering		Time allowed: 3 hours
Electrical engineering Dept.		Full mark: 85
Year: 1st Year-Electric.	Subject: Algorithms & Data structures	Final-Term Exam: 2 pages

Answer the following questions:

Question [1] (25 marks)

a) In data structures, what is the meaning of: stacks, queues, trees and graphs? (Explain your answer by details.)

b) Find the error of the following program and correct it (make a table):

1	#include<stdio>
2	void array_sum(int p[][3], int q[][3], int sum[][3])
3	main();
4	{
5	int a[2][3]={ {1,2,3}, {4,5,6} ;
6	int b[ ][ ]={ {1,1,1}, {2,2,2}};
7	int c[][];
8	int i, j;
9	array_sum(a,b,c)
10	for (i=0; i<2; i++)
11	{
12	for (j=0; j<3; j++)
13	printf("%3d, c[i][j]);
14	printf("\n");
15	}
16	}
17	void array_sum(int p[][3], int q[][3], int sum[][3]);
18	{
19	int i, j;
20	for (i=0; i<2; i++)
21	for (j=0; j<3, j++)
22	sum[i][j]= p[i][j]+q[i][j];
23	}

Question [2]: (20 marks)

a) What is the output of the following C program?

```
#include<stdio.h>
 main()
 {  int i=1;
        do
        {
              printf(" i= %d\n", i);
              i=i+1;
              if(i==5) break;
        }
        while (i<=10);
 }
```

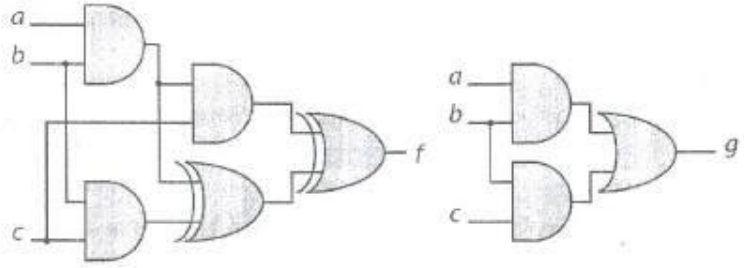
The maximum mark for the examination paper is 60 marks, and the mark obtainable for each part of a question is shown in brackets alongside the question.

Instructions to the candidates:

- Clarify your answer with the suitable sketches as you can.
- Please use a pen or heavy pencil to ensure legibility.
- Please attempt all questions.

QUESTION NUMBER ONE [25 MARKS]

1. What are three different ways of representing a signed number? Express the decimal number (- 46) as an 8-bit numbers in each of them, and then perform each of the following operations using the 2's complement form:
   a) 125 + 58, b) -127 + 31. Determine whether there is an overflow. [7 Marks]
2. Show the bit configuration that represents the decimal number 136.6875. Hereafter, represent the decimal number 136 in gray code (You MUST show your procedure). [6 Marks]
3. Consider the two circuits shown in figure. Use Boolean algebraic transformations to prove or disprove that the two circuits given below implement the same function (do not use a truth table or Karnaugh map). [6 Marks]



4. The following is the timing diagram of a logic circuit with 3 inputs. Sketch the logic circuit that generates this waveform. Then, write the VHDL code for the circuit described by the given timing diagram (Do not simplify). [6 Marks]