UNIVERSITY OF GHANA

BACHELOR OF SCIENCE IN ENGINEERING

SECOND SEMESTER EXAMINATIONS: 2016/2017

DEPARTMENT OF COMPUTER ENGINEERING

FAEN 112: C PROGRAMMING (2 Credits)

INSTRUCTIONS:
ANSWER ALL QUESTIONS IN YOUR ANSWER BOOKLET.

TIME ALLOWED: ONE-AND-HALF (1½) HOURS

SECTION A [30 marks]

1. Write down the complete output of programme ***MultParam*** below. **[15 marks]**

MultParam

```
#include <stdio.h>
void calc(int a,int b, double r, double s, int *c, double *t);
main()
{
  int           i=5,      j=6,      k;
  double        x=10.56,  y=22.3,    z;
  printf("i=%d \n\r j=%d \n\r x=%1f \n\r y=%1f \n\n",i,j,x,y);
  calc(i,j,x,y,&k,&z);
  printf("k=%d \n\r z=%1f \n\n",k,z);
  system("pause");
}

void calc(int a, int b, double r, double s, int *c, double *t)
{
  float highlevel;
  *c = a+b;
  *t = r+s+(*c);
  highlevel=(*c)+(*t);
  printf("*c=%d\n\r\ *t=%1f
  highlevel=%1f\n\n",*c,*t,highlevel);

}
```

2. Write down the content of file ***Q2_Output.txt*** after programme ***P2*** has run?

[15 marks]

Programme P2

```
#include <stdio.h>
#include <math.h>
main(void)
     {
     int i,j,k,num_elem;
     int x[20],y[20],z[20];
     FILE *infile, *outfile;
     infile = fopen ("D:\\Q2_Input.txt","r");
     outfile = fopen ("D:\\Q2_Output.txt","w");
     k = fscanf(infile,"%d%d",&x[0],&y[0]);
     fprintf(outfile,"k=%d\n",k);
     fprintf(outfile,"Value of EOF=%d\n",EOF);
     i=1;
     while (fscanf(infile,"%d%d",&x[i],&y[i])!=EOF) i++;
     num_elem=i;
     fprintf(outfile,"x[i]    y[i]    z[i]\n");
     for (j=0;j<num_elem;j++)
         {
         z[j]=sqrt(x[j]*x[j]+y[j]*y[j]);
         fprintf(outfile,"%d\t%d\t%d\n",x[j],y[j],z[j]);
         }
```

Assume that the content of file ***Q2_Input.txt*** is as follows:

3 4
6 8
9 12

SECTION B [70 marks]

3. The Volta River Authority operates a hydro power plant at the Akosombo Generation Station to produce electricity for Ghana. Suppose the hydro power plant runs all the time (without stopping) to supply electricity at a minimum operating water level of 73.15metres. Write a **C** programme that runs without stopping and takes a user's input (as water level) from the keyboard. Your programme should also perform the following:

   i) Displays a message for a user to input the water level from the keyboard.

   ii) Prints a message "OPERATING LEVEL: ABOVE 73.15" if the water level is above 73.15 metres.

   iii) Beeps a sound and prints a message "ALERT! BELOW MINIMUM" if the water level falls below 73.15metres.

[30 marks]

4. Write an interactive **C** program that calculates a customer's bill for a mobile telecommunication company. There are two types of customers: *residential* and *business*. There are two rates for calculating a bill: one for *residential customers* and one for *business customers*. For *residential customers*, the following rates apply:

   - Bill processing fee: GHC3.50
   - Basic service fee: GHC10.50
   - Premium channels: GHC8.50 per channel.

   For *business customers*, the following rates apply:

   - Bill processing fee: GHC12.00
   - Basic service fee: GHC20.00 for the first 20 connections, GHC4.00 for each additional connection
   - Premium channels: GHC40 per channel for any number of connections.

The program should ask the user for an account number (an integer) and a customer code. Assume that a customer code **100** stands for a *residential* customer, and **200** stands for a *business* customer.

Input: The customer's account number, customer code, number of premium channels to which the user subscribes, and , in the case of business customers, number of basic service connections. **[8 marks]**

Processing: The program should use the following functions to calculate and return the billing amount.

ResidentialBill: This function calculates and returns the billing amount for residential service. **[12 marks]**

BusinessBill: This function calculates and returns the billing amount for business service. **[10 marks]**

Output: Customer's account number, the type of service and the billing amount. **[10 marks]**