1. Given below is a program in C which does nothing but call a subroutine named Delay which uses empty for loops to create a software delay. The software delay uses an empty for loop with an integer counter.

   A) Run the program as is in the debugger and determine the length of the time delay.
   B) Change the delay loops from using integer variables to unsigned char variables and determine what difference that makes in the time delay. Explain.

   //Delay.c
   //This program illustrates a software delay.
   #include <reg51f.h>
   void Delay(unsigned char);
   void main()
   {
     while(1)
     {
       Delay(1);
     }
   }
   //
   void Delay(unsigned char x)
   {
     int c;
     int i;
     for(i=0;i<x;i++)
     {
       for(c=0;c<255;c++);
       return;
     }
   }

2. Write a program segment that shows how to declare the following:
   A) A variable named P1_0 which corresponds to bit 0 of port 1.

   B) An unsigned character named c in bdata memory.

   C) A bit named bit0 which corresponds to bit 0 of character c in part B.

   D) A bit named y which can be set equal to P1_0 in part A.

3. Write a program that calls a subroutine named Sub1 where Sub1 switches register banks and uses bank 1. Run the program in the debugger and verify that this is so.
4. Write a program to create two arrays of unsigned chars in program memory. In the first array store the first 10 letters of the alphabet as ascii code. In the second array store the data 1, 2, 3, 4, and 5 as numeric data. Send the first three bytes of each array to ports 0, 1, and 2 and use the debugger to verify that the data is sent correctly.

5. Write a C program that does sequential logic on the bits of port 1. Implement the following logical functions.

\[ y_0 = \overline{y_1} \cdot x_0 \cdot \overline{x_1} \cdot x_2 \]
\[ y_1 = \overline{y_0} \cdot x_0 \cdot \overline{x_1} \cdot x_2 \]

where
- \( x_0 = \) bit 0 of port 1
- \( x_1 = \) bit 1 of port 1
- \( x_2 = \) bit 2 of port 1
- \( y_0 = \) bit 3 of port 1
- \( y_1 = \) bit 4 of port 1

6. Write a C program which uses timer 0 to produce a 30KHz square wave on P3.0. The timer should be used with an interrupt.