Review Questions for Exam 3

1. PWM has been called the "poor man's A/D converter". What are the advantages and disadvantages of using PWM as an A/D converter?

2. The program below outputs a square wave to an output pin on the ARM7 processor.
   A) Which pin is used for output?
   B) What is the frequency of the square wave?

   ```c
   int main()
   {SYSAHBCLKCTRL |= (1 << 8); //Enable clock for 16-bit timer 1
    GPIO0DIR |= 2;            //Port0.1 set to output
    TMR16B1PR = 1;           //Prescale register. Divide P Clock by 2 = 24 MHz
    //MR0 sets the base frequency. Clock period is 1/24MHz = 0.04167usec.
    // 1024 x 0.04167usec = 42.67 usec = 23.435 KHz base frequency
    TMR16B1MR0 = 1024;       //Match count is 1024 -> generates interrupt
    TMR16B1MCR |= 1;         //Generate an interrupt if match on MR0
    TMR16B1MCR |= (1 << 1);  //Causes TimerCounter to be reset if match on MR0
    TMR16B1TCR |= 1;         //Enable TimerCounter to run
    while(1)
    {while((TMR16B1IR & 0x01) == 0); //wait for timer to reach count
     GPIO0DATA ^= 0x2;           //Toggle P0.1
     TMR16B1IR = 1;              //Reset interrupt bit
    }
   }
   ```

3. Modify the while loop problem 2 above so that the square wave that is output is only half as fast.

4. Suppose that in a C-program you have an output variable y which varies from 0 to 1. Suppose you are using TMR16B1MR0 to hold the data for a PWM channel. The PWM is set up to have 1024 counts in the base frequency. Show how to output the variable y to the TMR16B1MR0 register in C-code.

5. Repeat problem 4 but change the variable y such that -1 < y < 1 and the PWM channel has on 256 counts in the base frequency.
6. Assume that the A to D converter on the ARM Cortex M0 has been set up with the appropriate ports. Fill in the code below so that the program takes in the data from the A to D, multiplies it by 10 and divides it by 7 and sends the 10-bit converted data to P0.0 – P0.9.

```c
int y;
while (1)
    {AD0CR |= (1 << 24);   //Start conversion
     while(AD0DR0 < 0x7FFFFFFF);    //Wait for done bit
     { //Put your code here
```

7. Assume that P0 has been set up as all output pins. Write a statement to toggle only the even bits on P0 – bits 0, 2, 4, 6, … 11

8. Suppose that the following values have been set for the ARM Cortex M0 processor UART. What is the baud rate assuming a 12 MHz crystal and 48 MHz clock?

```c
UARTCLKDIV |= 2;
U0LCR  |= 1 << 7;
U0FDR  = 0x41;
U0DLL  = 250;
```