CSE/EE 5/7385 Microcontroller Architecture and Interfacing

HOMEWORK 5

1. An embedded systems designer is writing the controlling software using a combination of **C** and ARM inline assembly.

a) Give two valid reasons why the designer would choose to use inline ARM assembler language for portions of the software.

b) Give two valid reason why the designer would choose to use the **C** language for portions of the software.

2) Consider the following **C** code and assume that a variable of type **int** occupies 32 bits in a byte addressable memory with little endian storage. Also assume that the variable **test_data** is stored at address **0x200**.

```
#include <stdio.h>
void  main (void)
{
     int  test_data;
     int *test_pnt;
     test_data = 0x100;
     test_pnt=&test_data;

     printf("%d\n",test_data);      /* Statement A */
     printf("%x\n",test_data);      /* Statement B */
     printf("%d\n",&test_data);     /* Statement C */
     printf("%x\n",&test_data);     /* Statement D */
     printf("%d\n",test_pnt);       /* Statement E */
     printf("%x\n",test_pnt);       /* Statement F */
     printf("%d\n",*test_pnt);      /* Statement G */
     printf("%x\n",*test_pnt);      /* Statement H */
}
```

a) Statement A will causes the following value to be output **stdout**: _____

b) Statement B will causes the following value to be output **stdout**: _____

c) Statement C will causes the following value to be output **stdout**: _____

d) Statement D will causes the following value to be output **stdout**: _____

e) Statement E will causes the following value to be output **stdout**: _____

f) Statement F will causes the following value to be output **stdout**: _____

g) Statement G will causes the following value to be output **stdout**: _____

h) Statement H will causes the following value to be output **stdout**: _____

3) An embedded systems designer is using a polling loop to periodically access an I/O device.

a) Give an advantage of using a polling loop for this purpose.

b) Give a disadvantage of using a polling loop for this purpose.

4. An embedded systems designer is using an onboard programmable hardware timer to generate an interrupt periodically that causes the system to periodically access an I/O device.

a) Give an advantage of using the timer for this purpose.

b) Give a disadvantage of using the timer for this purpose.

5) An embedded systems designer implemented the system using a real-time operating system that supports task synchronization and contains deadlock avoidance.

a) What is a valid reason for implementing a system in the form of two or more tasks?

b) Name two methods commonly used to avoid deadlock.

c) Describe the concept of deadlock by indicating how it can happen.