Mid Term: Examination - Spring 2017

Course Code	*Course*	**Duration :**	**60 min**
CSE 345	**Real Time and Embedded Systems Design**	**Date:**	**31/3/2017**
Instructor/s	**Tamer Mostafa**	**Total Marks:**	**25 Marks**

General Instructions:

- *Please read the examination paper carefully*
- *The examination paper is divided into four questions-2 pages long. The total time allocated for the examination is 1 hour. You should answer all questions.*
- *Please assume any missing data in a logical manner.*
- *Only a non-programmable calculator may be used.*

Question 1: (4 Marks)

Choose the correct answer

1 UART provides: ( )
   a) Only serial communication
   b) Only parallel communication
   c) Both serial and parallel communication
   d) Mixed serial and parallel communication

2 Asking an I/O device whether it is finished by reading its status register is often called: ( )
   a) Interrupt request
   b) Read request
   c) Acknowledge
   d) Polling

3 Not recognizing lower priority interrupt until pending interrupt is complete is called: ( )
   a) Interrupt request
   b) Vectorization
   c) Masking
   d) Polling

4 Division by zero is an example of a: ( )
   a) Trap
   b) Exception
   c) Masking
   d) Polling

Question 2 (Cost Analysis, Serial Communication): (8 Marks)

I. Two products A and B with NRE cost of $2000 and $100,000 respectively. The unit cost of product A is $100 and that of B is $2. Calculate the number of products that should be manufactured, so that the per-product costs of both A and B are the same. **(3 Marks)**

II. We have 200 pages of ASCII data to be sent using asynchronous serial data transfer (a page is 80x25 characters). Assume a data size of 7 bits, plus 1 parity bit for error checking. The frame consists of 1 start bit, data and parity bits, and 1 stop bit. **(5 Marks)**

   a) What is value of the parity bit in case of even parity and odd parity?

   b) Draw a figure showing the sequence of bits transferred in one of the asynchronous frames used to send the letter 'C' (ASCII code = 42 H). Assume an odd parity bit is used.

c) Calculate the total number of bits transferred for all the 200 pages.
d) Calculate the time it takes to transfer the 200 pages using 19200 bps
e) Find the overhead due to framing.

Question 3 (Assembly Programming): (6 Marks)

Write an ARM assembly code that takes as input an integer n, and outputs x=n*2, if n is odd, or x=n/2 if n is even. Assume n is a variable stored in the program.

Question 4 (Accessing I/O Devices): (7 Marks)

Write an ARM assembly program that reads a character from an input device, IN_DEV, and write it to an output device, OUT_DEV, using busy/wait I/O programming. The devices has two registers: a data register and a status register.

The input device sets its status register to 1 when a new character has been read; CPU must set the status register back to 0 after the character has been read

When writing, CPU must set the output status register to 1 to start writing and wait for it to return to 0.

The devices addresses are as follows:

	Data register	Status register
IN_DEV	0x1000	0x1001
OUT_DEV	0x1100	0x1101

Best wishes
Dr. Tamer Mostafa