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06EC82

Eighth Semester B.E. Degree Examination, June/July 2013

Embedded System Design

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. What is an embedded system? Define the three main characteristics of embedded systems that distinguish such systems from other computing systems. **(04 Marks)**

b. Derive the percentage revenue loss equation for a rise angle of 35°. Compute the percentage revenue loss if the products life time is 10 weeks and the delay in market is 5 weeks. **(08 Marks)**

c. Define the three main IC technologies. What are the benefits of using each of the three different IC technologies? **(08 Marks)**

2 a. Write a simple algorithm for finding the greatest common divisor of two numbers. Write the FSMD for this algorithm and explain how it can be optimized and write the optimized FSMD. **(10 Marks)**

b. Design a soda machine controller, given that a soda costs 75 cents and your machine accepts quarters only. Draw a black box view, come up with a state diagram and state table, minimize the logic and then draw the final circuit. **(10 Marks)**

3 a. Explain how a stepper motor is controlled using driver. Give relevant hardware and software details. **(08 Marks)**

b. The analog input range for an 8 bit ADC is from -2.5 V to +7.5 V. Determine the resolution of ADC and digital output in hexadecimal when the input voltage is 1.2 V. Trace successive approximation steps and show the binary output of the ADC. **(08 Marks)**

c. A watchdog timer that uses two cascaded 16 bit up counters is connected to an 11.981 MHz oscillator. A timeout should occur if the function watchdog_reset is not called within 5 minutes. What value should be loaded into the upcounter pair when the function is called? **(04 Marks)**

4 a. Describe fully associative cache mapping technique. **(06 Marks)**

b. Given the following three cache designs, find the one with the best performance by calculating the average cost of access. Show all calculations:

i) 4 K byte, 8-way set associative cache with a 6% miss rate; cache hit costs one cycle, cache miss costs 12 cycles.

ii) 8 K byte, 4-way set associative cache with a 4% miss rate; cache hit costs two cycles, cache miss costs 12 cycles.

iii) 16 K byte, 2-way set associative cache with a 2% miss rate; cache hit costs three cycles, cache miss costs 12 cycles. **(08 Marks)**

c. With a neat diagram, explain the advanced RAM architecture. Also explain how this is extended to improve the performance through synchronous DRAM. **(06 Marks)**

PART – B

5 a. Describe shared data problem with an example. Show how disable/enable interrupt can be used for solving this problem. **(10 Marks)**

b. What is interrupt latency? What factors affecting it? **(04 Marks)**

c. Consider three processes with high, medium and low priorities respectively require an execution time of 150 μsec. 250 μsec and 350 μsec. If the interrupts are disabled for 200 μsec and the deadline for the low priority process is 850 μsec, determine its worst case interrupt latency. Can it meet the deadline, if the other two interrupts occur? Illustrate with a timing diagram. **(06 Marks)**

6 a. What are semaphores? Explain the semaphore problems in RTOS. **(07 Marks)**

b. Explain the RTOS functions "take semaphore" and "release semaphore" with an example. **(06 Marks)**

c. What is a task? Explain the three different task states. **(07 Marks)**

7 a. Describe the two rules that an RTOS environment must flow for interrupt routines. **(08 Marks)**

b. Explain the advantages and disadvantages of using larger number of tasks in RTOS. **(06 Marks)**

c. Identify the bug in the following program and explain:

```
Void Task1(void)
{
    :
    :
  VcountErrors (a) ;
    :
    :
 }
 Void Task 2(Void)
{
    :
    :
  VcountErrors (11) ;
    :
    :
}
Static int cErrors ;
Void VcountErrors (int CNew Errors)
{
   CErrors + = CNewErrors ;
}
```

(06 Marks)

8 a. Explain "encapsulating semaphores" with an algorithm. **(08 Marks)**

b. Explain the methods to save code space and methods to save power. **(08 Marks)**

c. What is an event? Explain the three standard features of it. **(04 Marks)**

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