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Seventh Semester B.E. Degree Examination, June/July 2016
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? List out three kinds of computing engines that are utilized in embedded system. **(04 Marks)**
   b. Briefly describe the major elements of embedded system development life cycle. **(08 Marks)**
   c. Define: i) Watch dog timer   ii) Instruction cycle
              iii) Hard real time system   iv) Soft real time system **(08 Marks)**

2 a. Briefly describe the more commonly used addressing modes. **(08 Marks)**
   b. Describe the four operations of instruction cycle in ISA and RTL level. **(06 Marks)**
   c. Write short notes on finite state machines. **(06 Marks)**

3 a. Write short notes on:
       i) Overlays
       ii) Dynamic RAM with read and write operation timing. **(08 Marks)**
   b. A system specification requires an SRAM system that can store upto $4K \times 16$ bit words, however the longest memory size available is $1K \times 8$ bit. Assume the processor having 16 address and data lines. Show the SRAM design for the above specification with read and write timing diagram. **(06 Marks)**
   c. Explain in detail direct mapped cache design with word size of 32 bits for:
       i) Cache size of 64K words organized as 128 0.5k word blocks.
       ii) Main memory size of 128 M words organized as 2k pages holding 128 blocks each. **(06 Marks)**

4 a. What is a product life cycle and explain briefly V life cycle and spiral mode. **(08 Marks)**
   b. List out the five steps and its importance in the design process of a successful embedded system design. **(06 Marks)**
   c. Briefly describe the three areas that should be considered in static analysis of a system design. **(06 Marks)**

PART – B

5 a. Define thread. Enumerate the difference between a process and a thread. **(05 Marks)**
   b. Write short notes on foreground/background system. **(05 Marks)**
   c. What is a scheduling strategy? Define the three general categories of scheduling strategy. **(04 Marks)**
   d. Explain the core responsibilities of operating system. **(06 Marks)**

6 a. Explain in detail about TCB (Task Control block) and its functions. **(06 Marks)**
   b. Briefly explain about interrupts and its importance in developing kernel of embedded software. **(06 Marks)**
   c. Describe the different kinds of stack that one might find in an embedded application. **(08 Marks)**

7 a. What is Amdahl's law? Consider a system with the following characteristics. The task to be analysed and improved currently executes in 100 time units and the goal is to reduce execution time to 80 time units. The algorithm under consideration in the task uses 40 time units. Calculate the amount of improvement required. **(05 Marks)**

b. Write short notes on Big 'O' notation. **(05 Marks)**

c. Perform the complexity analysis for loop constructs:
i) for loop
```
int sum = 0;
for (int j = 0; j < n; j++)
 sum = sum+j;
```
ii) while loop
```
int prod = 1;
int n;
while (! Done)
{ prod = prod*n;
n − −;
if(n < = 1)
done = true;
}
```
(10 Marks)

8 a. Define response time. Describe the major components of response time analysis of (i) polled loop, (ii) pre-emptive schedule in an embedded application. **(08 Marks)**

b. What are the common mistakes that might be made during performance optimization analysis? **(05 Marks)**

c. How can we measure and reduce the effect that a software algorithm can have on power consumption? **(07 Marks)**

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