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Seventh Semester B.E. Degree Examination, June/July 2018
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. Compare (i) Soft real time system and Hard real time system (ii) Microprocessor and microcontroller. (04 Marks)
- b. Define embedded system and give 4 examples. With a block schematic, explain the function of the various units in a microprocessor based embedded system. (08 Marks)
- c. With a flow diagram, explain the embedded system life cycle and also distinguish between traditional and contemporary design approaches. (08 Marks)
- 2 a. Compare (i) Big Endian and Little Endian formats (ii) Truncation and Rounding of numbers (iii) Direct and Register Direct addressing. (06 Marks)
- b. Let $E = 100 \text{ VDC} \pm 1\%$, $I = 10 \text{ A} \pm 1\%$ and $R = 10 \Omega \pm 1\%$. Determine the range of power measured using three different formulae for measurement of power, using a measurement system. (06 Marks)
- c. Write the RTN model of datapath and memory interface to a microprocessor and explain the function of the registers involved. For the 4 steps in an instruction cycle, explain the function and write ISA and RTL level instruction with an example. (08 Marks)
- 3 a. With diagrams distinguish between,
 - (i) SRAM and DRAM.
 - (ii) Direct mapped and associate mapped cache memories. (08 Marks)
- b. Explain (i) DRAM write timing diagram and (ii) DRAM refresh operation. (06 Marks)
- c. Write the memory interfacing diagram to design a $4\text{K} \times 16$ bits SRAM, using $1\text{K} \times 8$ bit SRAM chips. Also write SRAM read timing diagram. (06 Marks)
- 4 a. Explain waterfall and V Life cycle models for embedded system design and development. (10 Marks)
- b. Describe the system design specification and system functional specification for a digital counter with values assumed and necessary diagrams. (10 Marks)

PART – B

- 5 a. Define the four categories of multitasking operating system, with processes and threads. (04 Marks)
- b. With a state diagram, explain the functions of the various states and also the various fields in the task control block with its diagram, in the Task management function of OS. (08 Marks)
- c. Explain (i) Reentrant code (ii) Foreground / Background system (iii) Multiple Processes and (iv) Light weight threads and Heavy weight threads. (08 Marks)
- 6 a. Compare (i) User mode and supervisor mode (ii) Programs and Processes. (04 Marks)
- b. With a diagram, explain the functions of the various layers in a high level operating system architecture. (08 Marks)
- c. Write a C code for a simple operating system Kernel which uses a shared data buffer and Task control Block for asynchronous communication of three tasks for an application. (08 Marks)

- 7 a. Explain Amdahl's law with an equation and an example for the speed of execution. (04 Marks)
- b. Describe the time complexity analysis and Big-O notation for algorithm. (08 Marks)
- c. Analyze the selection sort algorithm for time complexity with sequence of steps and a C code for the same. (08 Marks)
- 8 a. Explain (i) Time loading (ii) Instruction counting and (iii) Preemptive scheduling (06 Marks)
- b. Explain total memory loading with an example and formula. How individual memory loading is calculated for each area in the memory map? (06 Marks)
- c. Describe atleast 8 tricks of the trade for reducing the response time and time loading. (08 Marks)

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