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Seventh Semester B.E. Degree Examination, June/July 2019

## Embedded System Design

Time: 3 hrs.

Max. Marks:100

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

### PART – A

- 1 a. What is an embedded system? Explain with an example in detail. (05 Marks)
- b. With a block diagram explain the various components in a microprocessor based embedded system. (07 Marks)
- c. Briefly describe the major elements of the embedded system development life cycle with a flow chart. (08 Marks)
- 2 a. Explain with block diagram four major blocks of an embedded Hardware core and typical bus structure comprising Address, Data and Control Signals. (05 Marks)
- b. Explain following addressing modes with an example for each:
  - i) Immediate mode
  - ii) Direct and indirect modes
  - iii) Indexed mode
  - iv) Program counter relative mode (08 Marks)
- c. Write the block diagram of RTN model for a microprocessor data path and memory interface. Also explain fetch, execute and next control operations with RTL instructions. (07 Marks)
- 3 a. Explain the internal diagram of SRAM and write the timing diagram for read operation. (07 Marks)
- b. Explain associative mapping cache implementation. (06 Marks)
- c. With respect to dynamic memory allocation, explain :
  - i) Swapping
  - ii) Overlays
  - iii) Multiprogramming. (07 Marks)
- 4 a. With a flow diagram briefly explain the V cycle model and the spiral life cycle model. (06 Marks)
- b. Write hardware architecture and data and counter flow diagram of a counter system and briefly explain flow diagram. (08 Marks)
- c. Explain the characterizing and identifying the requirements of a system with respect to a digital counter. (06 Marks)

### PART – B

- 5 a. Explain the following:
  - i) The CPU is a resource
  - ii) Lightweight and heavy weight threads
  - iii) A Single thread
  - iv) Multiple threads (08 Marks)
- b. Describe virtual machine model and high level model for OS architecture. (06 Marks)
- c. Discuss task control block. Mention some of the major components of task control also write C declarations for task control block. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 6 a. Explain the following:
- i) Basic diagram of possible task states
  - ii) Reentrant code
  - iii) Foreground/Background systems (06 Marks)
- b. Write the algorithm for a simple OS Kernel using C language notation for 3 asynchronous tasks sharing a common data buffer. (08 Marks)
- c. Explain the following:
- i) Duplicate hardware context
  - ii) Runtime stack
  - iii) Application stack (06 Marks)
- 7 a. Write the Amdahl's law for performance improvement/optimization. Consider a system with the following characteristics. The task to be analyzed 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. Determine unknown parameter value in the equation and write the inference. (07 Marks)
- b. Write a 'c' function to determine sum of elements in an array and analyze it line by line for its time proximity. (07 Marks)
- c. Analyze the following:
- i) For loops
  - ii) While loops
  - iii) Conditional statements (06 Marks)
- 8 a. Write and analyze linear search algorithm for its time complexity. (07 Marks)
- b. Write and analyze selection sort algorithm for its time complexity. (07 Marks)
- c. Describe memory loading with equation, figure and an example. (06 Marks)

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