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**Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019**  
**Embedded System Design**

Time: 3 hrs.

Max. Marks:100

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

**PART – A**

- 1 a. Define :
  - (i) An embedded system
  - (ii) Soft Real time system
  - (iii) Watch Dog Timer (06 Marks)
- b. Explain a microprocessor based embedded system with the help of a neat diagram. (06 Marks)
- c. Sketch the embedded system lifecycle and explain the various stages involved in it. (08 Marks)
- 2 a. Explain indexed mode and register indirect addressing modes with diagrams. Also write the timing diagram for serial write operation with a 8-bit register. (08 Marks)
- b. With a neat block diagram, explain the architecture of the datapath and the memory interface for a simple microprocessor at RTL. (06 Marks)
- c. Compare :
  - (i) Big Endian and Little Endian formats
  - (ii) RISC and CISC registers
  - (iii) Truncation and Rounding errors. (06 Marks)
- 3 a. Design a 4K×16 SRAM system and explain briefly. (08 Marks)
- b. Write the inside and outside diagrams for DRAM along with read operation. (06 Marks)
- c. Explain associative mapping cache implementation. (06 Marks)
- 4 a. Briefly explain waterfall, V cycle and spiral life cycle models with neat flow diagrams. (10 Marks)
- b. Write a hardware architecture and data and control flow diagram of a counter system and explain the flow diagram briefly. (06 Marks)
- c. Discuss functional model versus architectural models of an Embedded system. (04 Marks)

**PART – B**

- 5 a. Differentiate between :
  - (i) Program and process
  - (ii) Processes and threads
  - (iii) Supervisor and user privilege modes (06 Marks)
- b. Explain any 6 functions of an embedded operating system? (06 Marks)
- c. Discuss Task control block with a neat diagram. Explain the major components involved in TCB. (06 Marks)
- d. Draw the Task state diagram. (02 Marks)

- 6 a. What is foreground and background systems? Write the differences between foreground and background tasks. (05 Marks)
- b. Describe virtual model and high level model for operating system architecture. (05 Marks)
- c. Write the algorithm for a simple OS kernel, using C language notation for 3 asynchronous tasks using TCBs only. The 3 tasks use a common data buffer for read, increment and display operations. (08 Marks)
- d. Mention four categories of multitasking OS? (02 Marks)
- 7 a. Write the Amdahl's limitation for performance / optimization. Consider 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 to be improved uses 40 time units. Determine the unknown parameter and write the inference. (06 Marks)
- b. Write C function to determine the sum of the elements in an array and analyse it for its time complexity. (06 Marks)
- c. Explain the Big-O notation used for comparing the algorithms along with table and graphs. Mention the rules used for Big-O arithmetic. (08 Marks)
- 8 a. Write short notes on the following :  
(i) Tricks of the trade  
(ii) Performance Optimization (10 Marks)
- b. Write and analyse a linear search algorithm for its time complexity. (05 Marks)
- c. Describe memory loading with equation and an example. (05 Marks)

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