18EC62

USN

Sixth Semester B.E. Degree Examination, Dec.2024/Jan.2025
Embedded Systems

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Describe the various units designed in the ARM Cortex M3 architecture, with a neat diagram. **(10 Marks)**

   b. Explain the exceptions and IRQ interrupts of ARM Cortex M3 with a table and write the 2 timing diagrams when exception and interrupts are to be handled in privileged modes only, during the execution of a privileged or user thread. **(10 Marks)**

OR

2 a. Describe the general purpose Registers, $R_{13} - R_{15}$, special registers and PSR in detail, with the relevant diagrams for all. **(10 Marks)**

   b. Explain the reset sequence and PUSH and POP instructions with examples, along with relevant diagrams for both. **(10 Marks)**

Module-2

3 a. Describe IF-THEN-ELSE, shift and rotate instructions (5 types) and logic operation instruction (4 types) with examples. **(11 Marks)**

   b. Explain the following instruction with an example for each MLA, REV, STR, MSR. **(04 Marks)**

   c. Develop an assembly level language program to add the decimal integer numbers 1 to 20. The result should be stored in register R_9, with counter as R_8. **(05 Marks)**

OR

4 a. Describe the ARM ALP/HLP development tools and the organization of CMSIS with diagrams. **(11 Marks)**

   b. Explain the following instructions with an example for each: MRS, LDR, ADC, NEG. **(04 Marks)**

   c. Develop a 'C' language program to switch ON or OFF a RED lamp with a delay program having a maximum count of 100 in decimal, for ARM cortex M3 processor. ON and OFF time should be equal. **(05 Marks)**

Module-3

5 a. Explain the four classifications of embedded system with features and examples based on the generations. **(04 Marks)**

   b. Describe the elements of an embedded system with a block diagram. Also, explain any four types of ROMs. **(12 Marks)**

   c. Differentiate between RISC and CISC architectures, with respect to their features in the design. **(04 Marks)**

OR

6 a. Explain any four purposes of embedded systems, with suitable examples for each. **(04 Marks)**
   b. Describe optocoupler, DRAM and SPI with diagrams. **(12 Marks)**
   c. Differentiate between embedded and general computing systems with respect to the design based on the applications. **(04 Marks)**

Module-4

7 a. Explain any four characteristics of embedded systems. **(04 Marks)**
   b. Develop and explain the sequence of steps in the design of a Tea or Coffee vending machine, using FSM model only. **(08 Marks)**
   c. Describe the embedded firmware design using ALP with its advantages and disadvantages, along with ALP to MLP conversion procedure. **(08 Marks)**

OR

8 a. Explain any four operational quality attributes in an embedded system design. **(04 Marks)**
   b. Develop and explain the flow in the design of a seat belt warning system, with a sequential program model only. **(08 Marks)**
   c. Describe the embedded firmware design using HLP, with its merits and demerits. How HLP is concreted to MLP in the design process? **(08 Marks)**

Module-5

9 a. Explain the function of a process with a state transition diagram, structure and memory organization of a process. **(08 Marks)**
   b. Explain preemptive SJF scheduling with an example. **(06 Marks)**
   c. Describe deadlock with the various conditions favouring deadlock situation. **(06 Marks)**

OR

10 a. Explain the various units in embedded system development environment with a diagram (IDE). **(08 Marks)**
   b. Explain Round Robin scheduling technique with an example. **(06 Marks)**
   c. Describe the functions of Real Time Kernel in RTOS, in brief. **(06 Marks)**

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