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Sixth Semester B.E. Degree Examination, Feb./Mar.2022 ARM Microcontroller & Embedded Systems

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. Write a neat diagram of architecture of ARM Cortex-M3 processor and explain each block in brief. (09 Marks)
- b. Explain the operation modes of cortex M3 processor with diagram. (04 Marks)
- c. Briefly explain the reset sequence of Cortex-M3 processor. (03 Marks)

OR

- 2 a. Explain general purpose and special registers of Cortex M₃ Processors. (08 Marks)
- b. Indicating the need, explain PUSH and POP operations with an example for each. (04 Marks)
- c. Write the debugging support features of cortex M₃ processor. (04 Marks)

Module-2

- 3 a. Briefly explain the following instructions of Cortex M₃ processor:
 (i) ADDS R₀, R₀, R₁ (ii) PUSH {R₄ – R₆, LR}
 (iii) CBNZ R₀, label (06 Marks)
- b. Write a C program to toggle (blink) an LED connected to P_{0.4} pin of cortex-M₃ processor. Use suitable delay. (05 Marks)
- c. Write and explain memory mapping of cortex M₃ processor. (05 Marks)

OR

- 4 a. What is CMSIS? Discuss the CMSIS core structure. (10 Marks)
- b. Briefly explain following instructions of cortex M₃ processor with an example,
 (i) MSR and MRS (ii) BFC and BFI (iii) SXTB and UXTB (06 Marks)

Module-3

- 5 a. Explain classification of embedded systems. (05 Marks)
- b. Briefly explain the core of an embedded system. (05 Marks)
- c. Discuss optocoupler and relay in brief. (06 Marks)

OR

- 6 a. What are programmable logic devices? Compare CPLD and FPGA's. List the advantages of PLD over fixed logic devices. (06 Marks)
- b. List different on board communication interfaces and explain any one. (06 Marks)
- c. Write a note on embedded firmware. (04 Marks)

Module-4

- 7 a. What is operational quality attribute? Explain operational quality attributes to be considered in embedded system design. (06 Marks)
- b. Explain two basic approaches used in embedded firmware design. (06 Marks)
- c. Mention the advantages and drawbacks of assembly language based development. (04 Marks)



OR

- 8 a. Explain the different characteristics of embedded systems in detail. (07 Marks)
- b. Design a coin operated public telephone unit based on FSM model for following requirements:
- (i) Calling process is initiated by lifting the receiver.
 - (ii) After lifting user has to insert 1 rupee coin to make call
 - (iii) If line is busy coin is returned
 - (iv) If line is through he can talk till 60 seconds.
 - (v) If user does not insert another 1 rupee coin call is terminated after 60 seconds (after 45th second prompt is initiated to insert coin)
 - (vi) System is ready to accept new call when receiver is placed in hook.
 - (vii) System goes to 'out of order' when there is line fault. (06 Marks)
- c. What is hardware and software codesign? (03 Marks)

Module-5

- 9 a. What is a Kernel? Explain classifications of Kernel? (04 Marks)
- b. Three processes with process IDS P_1 , P_2 and P_3 are having estimated completion time of 10, 5, 7 milliseconds respectively enters the ready queue together. Calculate the waiting time and turn around time for each process and the average waiting time and turn around time (assuming no I/O waiting for the processes) in SJF algorithm. (06 Marks)
- c. Explain the concept of deadlock with an example. Also explain the methods of handling deadlock.) (06 Marks)

OR

- 10 a. Define the terms:
- (i) Process
 - (ii) Task
 - (iii) Thread (06 Marks)
- b. Explain RTOS in brief. (04 Marks)
- c. Explain simulator based debugging and ICE based target debugging techniques. (06 Marks)
