15EC62

Sixth Semester B.E. Degree Examination, Jan./Feb. 2023
ARM Microcontroller and 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. Explain the configuration of Program Status register and how it is accessed. (08 Marks)
   b. Explain operation modes of Arm Cortex M3. (04 Marks)
   c. Explain the reset sequence. (04 Marks)

OR

2 a. Explain the use of Link register with an illustration. (04 Marks)
   b. Explain Arm Cortex M3 stack implementation and operations. (08 Marks)
   c. Explain the role of CONTROL register. (04 Marks)

Module-2

3 a. Explain the following Arm Cortex M3 instructions:
      (i) LDRH (ii) BIC (iii) MVNS (iv) ASR (v) BFC (10 Marks)
   b. Develop an assembly level program to find number of 1's in a given 32 bit number and store the result in a memory location. (06 Marks)

OR

4 a. Explain Arm Cortex M3 instructions which alter program counter content. (10 Marks)
   b. Develop a C language program to blink Led and explain the program. (06 Marks)

Module-3

5 a. Compare general purpose computing system and embedded system. (05 Marks)
   b. Explain working of SRAM cell using six transistors. (04 Marks)
   c. Explain the sequence of operation for communicating with I2C slave device. (07 Marks)

OR

6 a. Explain the concept of load store architecture and instruction pipelining. (08 Marks)
   b. With a circuit diagram explain the role of Brown-out protection circuit. (04 Marks)
   c. Explain the operation of transistor based relay driver circuit. (04 Marks)

Module-4

7 a. Explain the important operational quality attribute to be considered in any embedded system. (06 Marks)
   b. Design an automatic tea/coffee vending machine based on FSM model which works after inserting coin and has option coffee, tea and cancel. (06 Marks)
   c. Explain steps involved in converting an assembly language code into machine language code. (04 Marks)

OR

8 a. What is hardware software co-design? Explain the fundamental issues in hardware-software co-design. **(07 Marks)**

   b. Explain Super Loop based approach for embedded firmware design. **(05 Marks)**

   c. Explain Data Flow Graph (DFG) model. Give a real world example. **(04 Marks)**

Module-5

9 a. Explain the function handled by a general purpose kernel. **(06 Marks)**

   b. Explain structure of a process with its memory organization. **(04 Marks)**

   c. Three processes with IDs P1, P2, P3 with estimated completion time 6, 4, 2 ms respectively, enters the ready queue together in the order P1, P2, P3. Calculate the waiting time and Turn Around Time (TAT) for each process and the average waiting time and TAT in RR algorithm with Time Slice = 2 ms. **(06 Marks)**

OR

10 a. Explain time management by RTOS kernel **(06 Marks)**

   b. Explain POSIX threads and its primitives. **(05 Marks)**

   c. What is a deadlock? Explain the different conditions favouring a deadlock situation. **(05 Marks)**

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