PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING
MID TERM EXAMINATION - OCT 2023

Semester : Semester VII - 2020   **Date :** 31-OCT-2023
Course Code : ECE3040   **Time :** 9:30AM - 11:00AM
Course Name : Sem VII - ECE3040 - Embedded Systems   **Max Marks :** 60
Program : B. TECH   **Weightage :** 30%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS   **(5 X 2 = 10M)**

1. Quality attributes are the set of system functional and non-functional requirements that are used to evaluate the system performance. Define the following Operational quality attributes of the Embedded System.
    i) Throughput
    ii) Reliability

    (CO1) [Knowledge]

2. A major element of every microcontroller-based embedded system is memory. Embedded systems memory types are crucial components in designing efficient and effective systems. Describe the selection memory for the Embedded Systems.

    (CO1) [Knowledge]

3. Endianness is a term that describes the order in which a sequence of bytes is stored in computer memory. Endianness can be either big or small, with the adjectives referring to which value is stored first. Represent the following data in Little Endian and Big Indian
    Data 1: FF208779h
    Data 2: 1209AA2h.

    (CO1) [Knowledge]

4. The Program Status Register(PSR) is a hardware register that contains information about the state of the processor. Individual bits are implicitly or explicitly read and/or written by the machine code instructions executing on the processor. List the various bits available in the xPSR for the programmer for programming.

    (CO2) [Knowledge]

5. The extended instruction set in Thumb-2 is a superset of the 16-bit Thumb instruction set, with additional 16-bit instructions alongside 32-bit instructions. Mention the advantages of Thumb-2 Instruction set over ARM Instruction set.

    (CO2) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS   **(2 X 15 = 30M)**

6. Embedded System is an integrated system that is formed as a combination of computer hardware and software to perform specific function. These Embedded systems range from those low in complexity, with a single microcontroller chip, to very high with multiple units, peripherals and networks. Discuss in brief the various cores used in the development of embedded systems.

                                                        (CO1) [Comprehension]

7. The addressing mode refers to the way in which the operand of an instruction is defined and it specifies a rule for interpreting or modifying the address field of the instruction before the operand is actually executed. Illustrate the different addressing modes available in the ARM Processor and output for each of the following cases. Given R0= 52120211h, R1= 10131514h, and R3= 01221FEEh.
   (a) LDR R5, [R1, R0 LSR#3]
   (b) STR R3, [R0, R1 LSL#4]
   (c) STR R1, [R3], R0
   (d) LDR R2, [R1], -R3, LSR#4

                                                        (CO2) [Comprehension]

PART B

ANSWER THE FOLLOWING QUESTION   **(1 X 20 = 20M)**

8. The Cortex-M3 Processer offers many new features including Thumb-2 Instruction Set and very low power consumption, low interrupt latency. The Cortex-M3 core and the integrated components have been specifically designed to meet the requirements of minimal memory implementation, reduced pin count and low power consumption. With features explain the Architectural Block Diagram of ARM Cortex™-M TM4C123X Processor.

                                                        (CO2) [Application]