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| **USN** |  |  |  |  |  |  |  |  |  |  | **21CS42** |
| **Fourth Semester B.E. Degree Examination, Apr/May 2023**  **Embedded System Concepts with ARM** | | | | | | | | | | | |
| **Time: 3 hrs.Max. Marks: 100** | | | | | | | | | | | |

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

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| **Q. No.** | | | **Questions** | **Marks** | **BL/CO** |
| **Module I** | | | | | |
| **1** | a. | | Define Embedded systems. Is DVD player an embedded system? Give reasons. | 8 | CL/CO1 |
| b. | | Explain the Super Loop Based Approach. | 7 | CL/CO1 |
| c. | | Compare Embedded systems with General Computing Systems. | 5 | CL/CO1 |
| **OR** | | | | | |
| **2** | | a. | Write the FSM model for automatic seat belt warning system. | 8 | CL/CO1 |
| b. | Explain the operational quality attributes of an embedded system. | 7 | CL/CO1 |
| c. | Bring out the Purpose of Embedded systems. | 5 | CL/CO1 |
| **Module II** | | | | | |
| **3** | | a. | Explain the Data flow model of ARM core with neat diagram. | 8 | CL/CO2 |
| b. | Illustrate the different processing modes available in ARM with CPSR. | 7 | CL/CO2 |
| c. | What are Banked Registers. Explain with a neat diagram. | 5 | CL/CO2 |
| **OR** | | | | | |
| **4** | | a. | Explain the ARM program structure with assembler directives and also write an ALP to find the largest no. in an array. | 8 | CL/CO2 |
| b. | Illustrate ARM pipeline Instruction sequence with an example. | 7 | CL/CO2 |
| c. | Explain Exceptions, Interrupts, and the Vector Table. | 5 | CL/CO2 |
| **Module III** | | | | | |
| **5** | | a. | Demonstrate the following instruction sets with suitable examples.  i)MOV ii) ADD iii)RSB iv) SBC | 8 | CL/CO3 |
| b. | Explain different barrel shifter operations. | 7 | CL/CO3 |
| c. | Perform the following operations   1. PRE r0= 0x00000000 ii)PRE r0=0x00000000   r1=0x00000077 r1=0x00000000  RSB r0, r1, #0 r2=0xf0000002  POST r0=? R3=0x00000002  UMULL r0, r1, r2, r3  POST r0=?,r1=? | 5 | CL/CO3 |
| **OR** | | | | | |
| **6** | | a. | Illustrate Pseudo instructions for loading constant with example. | 8 | CL/CO3 |
| b. | Explain Addressing modes for Load- Store Multiple Instructions. | 7 | CL/CO3 |
| c. | Explain Addressing methods for Stack operations. | 5 | CL/CO3 |

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| **Module IV** | | | | |
| **7** | a. | Explain the operation of stepper motor operating in Full step, Wave step and Half step with interfacing diagram of stepper motor through driver circuit. | 8 | CL/CO4 |
| b. | Explain Matrix Keyboard Interfacing with neat diagram. | 7 | CL/CO4 |
| c. | Write short notes on the following  i)Zigbee ii) sensors iii)Actuators iv)Wi-Fi | 5 | /CO4 |
| **OR** | | | | |
| **8** | a. | Discuss the following  i)I2C bus ii)SPI bus iii)UART iv) USB | 8 | CL/CO4 |
| b. | Explain RS-232 C & RS-485 external communication Interfaces. | 7 | CL/CO4 |
| c. | Explain the role of watchdog Timer in Embedded system. | 5 | CL/CO4 |
| **Module V** | | | | |
| **9** | a. | Write a multithreaded application to print “Hello I am in Sahyadri” from the main thread and “Hello I am in CSE” 5 times each using pthread\_create() and pthread\_join() | 8 | CL/CO5 |
| b. | Explain the sequence of operations for embedding firmware with programmer with neat diagram. | 7 | CL/CO5 |
| c. | Explain In system programming with SPI protocol. | 5 | CL/CO5 |
| **OR** | | | | |
| **10** | a. | Explain multithreaded architecture of a process with a neat thread –process diagram | 8 | CL/CO5 |
| b. | With a neat diagram explain JTAG based boundary scanning for hardware testing. | 7 | CL/CO5 |
| c. | List out the advantage of Simulator based debugging | 5 | CL/CO5 |

**Cognitive Levels of Bloom’s Taxonomy**

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| **No.** | CL1 | CL2 | CL3 | CL4 | CL5 | CL6 |
| **Level** | Remember | Understand | Apply | Analyze | Evaluate | Create |

**Course Outcomes**

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| CO1 | Describe the characteristics, quality attributes for designing an embedded system. | CL2 |
| CO2 | Illustrate the architectural features of ARM controller. | CL3 |
| CO3 | Use ISA (Instruction set architecture)of ARM controller to develop programs. | CL3 |
| CO4 | Interface the peripheral devices with LPC2148 microcontroller. | CL3 |
| CO5 | Demonstratethe real time operating system by using case studies. | CL3 |