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## SEMESTER END EXAMINATIONS – JULY / AUGUST 2022

**Program : B.E. : Computer Science and Engineering**

**Semester : IV**

**Course Name : Microprocessors and Microcontrollers**

**Max. Marks : 100**

**Course Code : CS43**

**Duration : 3 Hrs**

### Instructions to the Candidates:

- Answer one full question from each unit.

#### UNIT- I

- Discuss the various components of MU0 Microprocessor with a neat diagram. CO1 (06)
  - Discuss the two Pipeline Hazards while using a RISC Processor. CO1 (08)
  - What is result and NZCV status flag values when the following arithmetic operations are done on APSR register? Justify your answer. CO1 (06)
    - $0x70000000 + 0x70000000$
    - $0x00001234 - 0x00001000$
    - $0x80000000 + 0x80000000$
    - $0x90000000 + 0x90000000$
- Discuss the key System and Implementation features of Cortex M0 microcontroller. CO1 (08)
  - Explain the various control signals for Data operations in MU0 Microprocessor with a diagram showing various registers. CO1 (06)
  - Explain features of Cortex M0 making it suitable for low power applications. CO1 (06)

#### UNIT – II

- Find the Result and status of ALU Flags for the given below operations: CO2 (05)  
 $0x80000005 - 0x80000004$   
 $0xA0000000 - 0xA0000000$   
 $0x80000000 + 0x80000000$   
 $0x70000000 + 0x70000000$   
 $0xFFFFFFFF - 0xFFFFFFFFC$
  - Compare and contrast PSP and MSP. CO2 (05)
  - Write a startup sequence of cortex M0 processor with a neat diagram. CO2 (10)
- Describe the Program image of a microcontroller. CO2 (08)
  - With a neat diagram, explain the different ways of structuring the flow of Application processing. CO2 (12)

## UNIT – III

5. a) Write a program to extract bits 16 to 11 using logical shift instruction? And also Write an assembly language program to realize the switch statement to allow a program to branch to multiple possible address locations based on the input. CO3 (08)
- b) Illustrate the extraction and clearing of 8 bit data from 32 bit data. CO3 (06)
- c) Discuss the utility of memory barrier instructions and sleep mode instructions. CO3 (06)
6. a) Enumerate and Explain the six 32 bit ARM Instructions used in Cortex M0. CO3 (08)
- b) Write a program to illustrate the function call from the same file as well as calling a function from another file. Also explain the concept of nested call. CO3 (08)
- c) Find the output of following code (any two) CO3 (04)
- i) LDR r2,=0x80000080;  
SXTB r0,r0
- ii) LDR r2,=0x80000080;  
SXTB r0,r0;
- iii) LDR r2,=0x80000080;  
SXTB r0,r0;

## UNIT – IV

7. a) Discuss the Utility EXE RETURN register and its utility for interrupts. CO4 (06)
- b) With timing diagram explain tail chaining and late arrival features of CORTEXM0. CO4 (08)
- c) Write a program to enable interrupt request IRQ4 using its control register. CO4 (06)
8. a) With timing diagram Explain the nested vector features of interrupt with EXE RETURN VALUES when the processor goes thread to A interrupt handler to B interrupt handler and returns from B handler to A handler and then to the main program. (Interrupt A is low priority interrupt B is high priority interrupt that arrives when A interrupt handler is half done). CO4 (08)
- b) Discuss properties of the various parts of the Cortex M0 memory space. CO4 (06)
- c) Examine special registers used to set priority for NVIC and SVC and PendSV exceptions. CO4 (06)

## UNIT – V

9. a) List and explain different types of sensor. CO5 (10)
- b) Implement a micropython code for the following CO5 (10)
- i. Interrupt programming
- ii. Soft reset
- iii. Past mode
10. a) Illustrate the working of stepper motor and describe the interfacing of stepper motor with an embedded microcontroller to rotate the stepper motor continuously. CO5 (10)
- b) List and explain the different components of ESP8266 Node Meu. CO5 (10)

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