Reg. No.



## III SEMESTER B.TECH. (ELECTRICAL & ELECTRONICS ENGINEERING)

## END SEMESTER EXAMINATIONS, NOVEMBER-DECEMBER 2023

## **MICROCONTROLLERS [ELE 2125]**

**REVISED CREDIT SYSTEM** 

Time: 3 Hours	Date: 02 DECEMBER 2023	Max. Marks: 50
Instructions to Candidates:		

- ✤ Answer ALL the questions.
- Missing data may be suitably assumed.
- **1A.** Write an alternate 8051 instruction/program to perform the following operations.
  - i. JBC PSW.0, SKIP
  - ii. CJNE A, 55H, NEXT
  - iii. DEC DPTR
- **1B.** An Array of eleven, eight- bit numbers are stored at successive external RAM locations starting at 8000H. Develop an 8051 assembly language program to create a new array from the existing array starting from 8021H with the numbers only divisible by '5'. Store the size of the new array in 8020H and replace the original locations with numbers not divisible by '5' with FFH.
- **1C.** What is interrupt priority status of 8051 when powered on? If Serial port interrupt is to be given highest priority and external port interrupt '1' is to be given lowest, how it can be done? Show the priority sequence then with proper justification.
- 2A. Develop an 8051 main program to toggle pin P1.2 once every 1 seconds. Use timer '0' in mode '2' to obtain the required delay. When external interrupt '1' /P3.3 interrupts the CPU, make a provision to display the decimal down counter from 50H to 1H at port '2' with a delay of 5 sec between successive counts and return back to the main program.
- **2B.** Debug the program given below to correct logical errors if any, and calculate the exact amount of delay generated by the modified program. Assume XTAL = 10 MHZ.

MOV TMOD,#10H BACK:MOV R0,#0FAH; MOV R1,#64H SETB TR0 MOV TH0,#72H WAIT:JB TF0,WAIT CLR TF0 DJNZ R1,WAIT DJNZ R2,BACK CLR TR0 END

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2C. Find the frequency and duty cycle of the rectangular waveform generated by the program code given below. Assume XTAL=12 MHz Program:

MOV TMOD,#20H MOV TH1, #64H SETB TR1 HERE:SETB P1.5 ACALL DELAY CLR P1.5 ACALL DELAY ACALL DELAY SJMP HERE DELAY:JNB TF1, DELAY CLR TF1 RFT

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- **3A.** Discuss the methods to reset 8051 microcontroller and describe what happens when 8051 is reset. With the help of a relevant circuit diagram, discuss how 8051 is reset correctly when 8051 is powered on.
- **3B.** Develop an interfacing circuit to interface a 16 pin, 16x2 LCD to 8051 microcontroller and develop an ALP to display the following characters on the LCD.

Character 'A' in first line first position.

Character 'G' in first line seventh position.

Character 'Q' in second line first position.

Character 'W' in second line seventh position.

- **3C.** Develop an interfacing circuit to interface ADC 0809 (8- channel, 8-bit ADC) to 8051 and develop an 8051 ALP to convert the analog input applied to channel 6 (IN6) to digital. Display the digital output at port 2. If the analog input is less than 3.5V, turn on the LED connected to P1.6 pin. Assume  $V_{REF}$  + = 5V and  $V_{REF}$  = 0V.
- 4A. Design an interfacing circuit to interface a matrix key board in a 2X 5 matrix form containing ten keys '0' to '4' in Row 1 and '5' to '9' in Row 2, to 8051. Use port '0' (P0.0 and P0.1) pins for the rows and port '1' pins (P1.0 to P1.4) for the columns. Show the connection diagram and develop an 8051 ALP to detect any key pressed and transfer the ASCII code of the key pressed to port '2'. Use software de bouncing technique. Assume XTAL = 11.0592MHz. (04)
- **4B.** A temperature sensor is interfaced with the 8051 through an 8- bit ADC connected on Port 1. Develop an assembly language program to transmit serially the message specified below at 19200 baud.
  - If ADC output is less than 30H "LOW"
  - If ADC output is greater than 30H, "HIGH"

8051 is clocked at 11.0592MHz.

(Hint: ADC output is available in port 1)

**4C.** Discuss any three enhanced features of RISC architecture available in ARM 7TDMI and associated instruction with an example for each.

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- **5A.** Develop an ARM assembly program to multiply an unsigned 32 bit number available in 0X6000 0X6003 memory location by 19 and store the result in 0X6004 0X6007 without using multiplication instruction.
- **5B.** The light output of a LED lamp is dependent on the drive current and its operating temperature. The experiments conducted at various temperature and current yielded a generalized equation given by

Where,

Y= Light output

A= LED constant

B= operating temperature

C= drive current

Develop an ARM ALP to evaluate the light output of LED lamp whose

- constant value =45
- Operating temperature = 30° C
- Drive current = 5A

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**5C.** Discuss the various operating modes of ARM7TDMI. Explain the register model of any one privileged mode, clearly showing visible and banked out registers.

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