X/D/TY

Reg. No:

Final Assessment Test – April 2025

Course: BECE204L - Microprocessors and Microcontrollers

Class NBR(s): 4037 / 4039 / 4041 / 4043 / 4046 / 4048 / 4050 / 4053 / 4055 / 4058 / 4060 / 4062 / 4064 / 4067 / 4069 / 4072 / 4074 / 4076 / 4081 / 4083 / 4085 / 4087 / 4089 / 4194

Slot: B2+TB2

Time: Three Hours

Max. Marks: 100

- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

Answer ALL Questions

(10 X 10 = 100 Marks)

1. In an 8-bit embedded system, how does the stack pointer and program counter interact during a subroutine call and return? What problems might arise if the stack overflows or underflows?

2. (i) Discuss the concept of "pipelining" in the 8086 microprocessor. How does the 8086 handle instruction prefetching, and what impact does this have on its performance?

   (ii) In 8086 Microprocessor, demonstrate the content of AX register and FLAGS after performing ADD AX, BX

   Given: AX = 0x8000 and BX = 0x8000

3. Develop an 8051 Assembly Language Program (ALP) to compare three 8-bit numbers stored in memory locations 30H, 31H, and 32H. Store the largest number at location 33H.

4. Analyse the following program and specify the data in the RAM locations, register A and Stack Pointer [SP] after execution of the program.

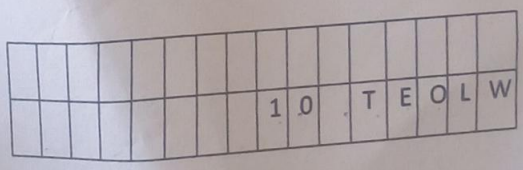
```
ORG 0
MOV SP, #60H
MOV R0, #10H
MOV R1, #20H
MOV R2, #30H
MOV R3, #40H
MOV R4, #50H
MOV R5, #60H
MOV R6, #70H
MOV R7, #80H
PUSH 02
```

```
PUSH 03
MOV A, R1
SUBB A, R0
JZ SkipPop
POP 05
SkipPop:
PUSH 04
MOV A, R6
ADD A, R5
POP 06
ADD A, R7
END
```

5. Develop an 8051 ALP to generate a wave of frequency 2 KHz with 50% duty cycle on P1.0 using Timer 1 for the delay creation. Assume XTAL = 11.0592MHz while P1 reads data from external source which should be sent to P2 continuously.

6. Develop an 8051 microcontroller ALP in which 8051 gets incoming data from the serial port. If the received data is odd then turn ON an LED at P1.3 else sound a buzzer at P2.4.

7.(a) Develop an 8051 ALP to store the message "**WELCOME TO 8051**" starting at ROM location 0300H. Display the characters on the LCD as show in the figure below



Reference:

01 – clear display

38 – 2 lines 5X7 matrix

0E – Display ON cursor blinking

06 – Increment cursor

04 – Decrement cursor

80 – Force cursor to beginning of first line.

C0 - force cursor to beginning of Second line

OR

7.(b) Develop an 8051 assembly code to display a countdown from "3" to "0" on a common cathode 7-segment display. The program should create a 1-second interval between each digit. Use Timer 1 to generate 1-second delay.

8.(a) Assume a switch is connected to P0.7. If SW=0, develop a program to generate a ramp waveform of 10 steps by interfacing DAC0808 with 8051 microcontroller else generate a saw tooth waveform with 5 steps.

OR

8.(b) Design a block diagram and the circuit diagram to interface a Heart Rate Monitor sensor with the 8051 microcontroller. The sensor provides an analog signal corresponding to the heartbeat rate. Explain the necessary signal conditioning steps, and describe how the microcontroller processes the data to display the heart rate on an LCD.

9. How does the data flow between the ALU (Arithmetic Logic Unit) and the Barrel Shifter in the ARM processor improve performance in real-time applications, such as mobile devices or IoT systems? Explain the process with a diagram, highlighting how efficient data manipulation and shifting operations are used in real-time control systems.

10. Apply the ARM instruction set to

(i) Move an 8-bit immediate value into R7.

(ii) Add a 16-bit immediate value to the contents of R5 and store the result in R5.

(iii) Logical shift left the contents of R8 by 4 and store the result in R6.

(iv) Subtract a 16-bit immediate value from the contents of R2 and store the result in R2.

(v) Compare the contents of R10 with a 16-bit immediate value.

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