

Roll No																			
---------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



**PRESIDENCY UNIVERSITY
BENGALURU**

**SCHOOL OF ENGINEERING
END TERM EXAMINATION - JUN 2023**

Semester : Semester IV - 2021

Course Code : ECE3111

Course Name : Sem IV - ECE3111 - Microprocessors and Microcontrollers

Program : CSE

Date : 16-JUN-2023

Time : 9.30AM - 12.30PM

Max Marks : 100

Weightage : 50%

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. All the activities of the Microprocessor/Microcontroller are synchronized with respect to a clock signal. Report the differences between an interrupt service routine (ISR) and a procedure.
(CO1) [Knowledge]
2. In 8086, every instruction follows certain rules to execute, and their alignment rules are important for execution. Indicate whether the following instructions are valid or invalid by giving a single-line justification.
(a) DIV AX, 07h (b) CMP AX, DS
(CO1) [Knowledge]
3. In the instructions of any microprocessor or microcontroller, there is an opcode and operand. Define each one of them with example.
(CO1) [Knowledge]
4. In an 8086 microprocessor, there are a few instructions that are used exclusively for logical operations. Among those are NEG instructions. Summarize the function of the NEG instruction.
(CO1) [Knowledge]
5. Microcontroller is like a set and the microprocessor is a subset of microcontroller. What is the substitute for instruction DJNZ in the 8051 microcontrollers? How is CJNE in 8051 different from CMP of 8086?
(CO1) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS

(2 X 15 = 30M)

6. (i) The program control instructions control the flow of program execution and are capable of branching to different program segments. What are JZ and JNZ program control instructions? (5M)
(ii) Logical instructions are used in many applications, including bit manipulation, data encryption, and data compression. They are an important part of the instruction set of the 8086 microprocessor and are used extensively in assembly language programming. Write a program to Swap the upper and lower bytes of the register using ROR instructions. (5M)
(iii) In 8051 microcontrollers the register DPTR holds the address for a memory location. Mention the difference between MOV, MOVC, and MOVX instruction in 8051. (5M)
(CO2,CO1) [Comprehension]
7. (i) The Microprocessor consists of only a Central Processing Unit, whereas in the Microcontroller many functions are integrated into one chip. These two concepts differ from each other in various other aspects. Mention all the key differences between a Microprocessor and a Microcontroller. (5M)
(ii) Every microcontroller has default values when it is powered on. When microcontroller 8051 is powered on then what is the value of the followings: (a) Program counter (PC) register (b) Stack pointer (SP) register (c) Which Register bank is selected? (3M)
Also, explain how different register banks are selected or switched using PSW.4 & PSW.3 bits of PSW register? (2M)
(iii) 8051 has 128 bytes of RAM and 4KB of ROM on-chip. Enumerate the SFR and if the on-chip memory is not sufficient explain how the external memory can be interfaced to 8051. (5M)
(CO2,CO1) [Comprehension]

PART C

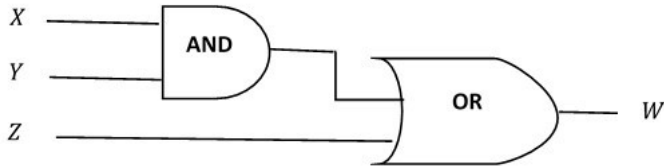
ANSWER ALL THE QUESTIONS

(3 X 20 = 60M)

8. (i) The addressing mode is the way the operands are specified in the instruction. Report all addressing modes of the 8051 microcontrollers by giving two examples of each. (10M)
(ii) Answer the following questions in short and to the point. (10M)
a) Examining the stack, show the contents of the register and SP after execution of the following instructions.
MOV SP, # 5FH
MOV R2, # 25H
MOV R1, # 12H
MOV R4, # 0F3H
PUSH 2
PUSH 1
PUSH 4
b) MOV R0, 12H- In this instruction, 12H is copied into Reg A, TRUE or FALSE
c) MOVX A, @DPTR- Explain the instruction.
d) MOVC A, @ A+PC, This instruction is used to access code from the external Memory. TRUE or FALSE.
e) Assume the contents A=45H, RAM location 78H= 12h and R1=78H, what will the contents of A after the execution of XCHD A, @R1

(CO1,CO2,CO3) [Application]

9. (i) The 8051 microcontroller uses various types of instructions like data transfer, ALU operations, Bit Manipulations, and Program Branching instructions. Write the 8051 assembly program to implement the following logic operation to be performed as shown in Figure below: (10M)



Assume that X and Y are 8-bit numbers and their product is also an 8-bit number.

- (ii) How many times AGAIN will be executed in the following program so that the contents of the AL register become 0Eh? Show the value to be loaded in the CL register. (5M)

```
MOV AL, 00H
MOV CL, ??H AGAIN:    ADD AL, 02H
DEC CL
JNZ AGAIN
```

- (iii) Consider you are assigned the task to call a Subroutine stored in the code segment itself with starting address as 6000H for the addition of two numbers and 7000H for division. Write an ALP for finding the average of three numbers 07h,09h, and 0Ah using call instructions and the above subroutines. (5M)

(CO3,CO1,CO2) [Application]

10. (i) 8051 instructions are categorized into mainly Data Transfer Instructions, Arithmetic Instructions, Logical Instructions, Boolean or Bit Manipulation Instructions, and Program Branching Instructions. Write an ALP to Transfer a block of data bytes from the source memory location 50H to the destination memory location 60H. (5M)

- (ii). Data Transfer Instructions of 8051 are meant for transferring of bits and bytes of data from one location to another. Write an ALP to Exchange two blocks of data bytes from the 80H source location to the 95H memory location. (5M)

- (iii) In 8086, based on the number of cycles consumed the instructions will occupy the memory locations sequentially, as shown below. Assume the system memory locations hold the following instructions: (5M)

Memory Location	Instructions	Instruction No.
FFFF:0000	MOV AX, 560FH	;#1
FFFF:0003	MOV DS, AX	;#2
FFFF:0005	MOV BX, [200H]	;#3
FFFF:0008	MOV AX, 7EF4H	;#4
FFFF:000A	MOV CS, AX	;#5
FFFF:000C	INC BX	;#6

- (a) The contents of which memory location (physical address) is moved into BX (after instruction #3)?

- (b) What is the memory location (segment: offset pair) accessed by the CPU after instruction #5 executes?

- (iii) The microprocessor has two units, the bus interface unit, and the execution unit. Each unit performs its tasks separately, but still, they must be synchronized using a clock generator. Whenever an instruction is executed, a particular sequence will be followed - like getting data, storing data, performing calculations, and so forth. On executing a set of instructions, the flag register values were obtained as given below. For each case, find the nature of the result that was obtained. (5M)

- a) ADD instruction; contents of the flag register is 0880H

- b) MUL instruction; contents of the flag register is 0045H

(CO3,CO1,CO2) [Application]