



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN MECHANICAL & AUTOMOTIVE ENGINEERING

BACHELOR OF TECHNOLOGY IN MARINE ENGINEERING

TEE 4343: FUNDAMENTALS OF MICROPROCESSOR.

END OF SEMESTER EXAMINATION

SERIES: APRIL 2025

TIME: 2 HOURS

DATE: APRIL 2025

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of FIVE questions. Attempt any THREE questions.

Do not write on the question paper.

QUESTION ONE

- With the aid of a block diagram of a microprocessor controlled system, describe the function of each block and its highways bus system 10 marks
- Write an assembly language program segment beginning at 3C4AH to subtract the byte B9H from the content of memory location 2CD3H, and then output the result to port 00H; add the data in register C to that in register L; then logically exclusive OR the sum with the content of register B, finally, decrement the result and store the it at memory location FF40H to end the program.

10 marks

QUESTION TWO

- a) Explain the significance of any FOUR flags in a Status register of Intel 8085 microprocessor
4 mark
- b) Let the accumulator and register L contain the value A6H and 7FH respectively. Determine the value in the accumulator and the associated status in the flag register after the following instructions have been executed, assume both the carry and parity bit (P = 1 for ODD and P = 0 for EVEN) are initially set.
- i) SUB L
 - ii) ADD L
 - iii) XRA L
- 6marks
- c) With the aid of a block diagram and flow chart describe how Interrupt driven I/O data transfer scheme is achieved between a microprocessor and an I/O device.
10 marks

QUESTION THREE

- a) Implement a memory capacity of 4Kx 8 using the available 1KB ROM chips
10 marks
- b) Using a block diagram describe the operation of the following serial interfaces
- i) Full duplex
 - ii) Half duplex
- 4 marks
- c) Explain the following addressing modes as applied to Intel 8085 microprocessor stating a typical example in each case
- i) Immediate
 - ii) Register Indirect
 - iii) Direct
- 6 marks

QUESTION FOUR

- a) Explain the function of the following software development tools
- i) Assembler
 - ii) Compiler
 - iii) Editor
- 6 marks
- b) Describe the four Fields that characterize an assembly language programming instruction format
4 marks
- c) The start addresses of memory devices in a memory system are given as:
- | | | |
|------|-----------|-------|
| 4KB | ROM Chip | 0000H |
| 6KB | PROM Chip | 1A00H |
| 50KB | RAM chip | 3500H |
- For each of the chip determine
- i) The range
 - ii) The number of pages
 - iii) Draw the device memory map
- 10 marks

QUESTION FIVE

- a) Define the following terminologies as applied to memory
5 marks
- i) Memory location
 - ii) Memory address
 - iii) Memory write operation
 - iv) Volatile memory
 - v) Memory cell
- b) Explain the function of the following special function registers applicable to Intel 8085 microprocessor
5 marks
- i) Program Counter
 - ii) Stack Pointer
 - iii) Instruction Register
 - iv) Memory Address Register
 - v) Memory Data Register

- c) Distinguish between sensors and actuators applicable to operation of microprocessor based system, for each give any two typical example 5 marks
- d) Explain the event that take place when the following instructions are executed 5 marks
- XCHG
 - CMA
 - PCHL
 - HLT
 - RAR

8085A CPU INSTRUCTIONS IN OPERATION CODE SEQUENCE

Table 5-2

OP CODE	MNEMONIC	OP CODE	MNEMONIC	OP CODE	MNEMONIC	OP CODE	MNEMONIC	OP CODE	MNEMONIC	OP CODE	MNEMONIC
00	NOP	28	DCX H	56	MOV D,M	81	ADD C	AC	XRA H	D7	RST 2
01	LXI B,D16	2C	INR L	57	MOV D,A	82	ADD D	AD	XRA L	D8	RC
02	STAX B	2D	DCR L	58	MOV E,B	83	ADD E	AE	XRA M	D9	-
03	INX B	2E	MVI L,D8	59	MOV E,C	84	ADD H	AF	XRA A	DA	JC Adr
04	INR B	2F	CMA	5A	MOV E,D	85	ADD L	B0	ORA B	DB	IN D8
05	DCR B	30	SIM	5B	MOV E,E	86	ADD M	B1	ORA C	DC	CC Adr
06	MVI B,D8	31	LXI SP,D16	5C	MOV E,H	87	ADD A	B2	ORA D	DD	-
07	RLC	32	STA Adr	5D	MOV E,L	88	ADC B	B3	ORA E	DE	SBI D8
08	-	33	INX SP	5E	MOV E,M	89	ADC C	B4	ORA H	DF	RST 3
09	DAD B	34	INR M	5F	MOV E,A	8A	ADC D	B5	ORA L	E0	RPO
0A	LDAX B	35	DCR M	60	MOV H,B	8B	ADC E	B6	ORA M	E1	POP H
0B	DCX B	36	MVI M,D8	61	MOV H,C	8C	ADC H	B7	ORA A	E2	JPO Adr
0C	INR C	37	STC	62	MOV H,D	8D	ADC L	B8	CMP B	E3	XTHL
0D	DCR C	38	-	63	MOV H,E	8E	ADC M	B9	CMP C	E4	CPO Adr
0E	MVI C,D8	39	DAD SP	64	MOV H,H	8F	ADC A	BA	CMP D	E5	PUSH H
0F	RRC	3A	LDA Adr	65	MOV H,L	90	SUB B	BB	CMP E	E6	ANI D8
10	-	3B	DCX SP	66	MOV H,M	91	SUB C	BC	CMP H	E7	RST 4
11	LXI D,D16	3C	INR A	67	MOV H,A	92	SUB D	BD	CMP L	E8	RPE
12	STAX D	3D	DCR A	68	MOV L,B	93	SUB E	BE	CMP M	E9	PCHL
13	INX D	3E	MVI A,D8	69	MOV L,C	94	SUB H	BF	CMP A	EA	JPE Adr
14	INR D	3F	CMC	6A	MOV L,D	95	SUB L	C0	RNZ	EB	XCHG
15	DCR D	40	MOV B,B	6B	MOV L,E	96	SUB M	C1	POP B	EC	CPE Adr
16	MVI D,D8	41	MOV B,C	6C	MOV L,H	97	SUB A	C2	JNZ Adr	ED	-
17	RAL	42	MOV B,D	6D	MOV L,L	98	SBB B	C3	JMP Adr	EE	XRI D8
18	-	43	MOV B,E	6E	MOV L,M	99	SBB C	C4	CNZ Adr	EF	RST 5
19	DAD D	44	MOV B,H	6F	MOV L,A	9A	SBB D	C5	PUSH B	F0	RP
1A	LDAX D	45	MOV B,L	70	MOV M,B	9B	SBB E	C6	ADI D8	F1	POP PSW
1B	DCX D	46	MOV B,M	71	MOV M,C	9C	SBB H	C7	RST 0	F2	JP Adr
1C	INR E	47	MOV B,A	72	MOV M,D	9D	SBB L	C8	RZ	F3	DI
1D	DCR E	48	MOV C,B	73	MOV M,E	9E	SBB M	C9	RET Adr	F4	CP Adr
1E	MVI E,D8	49	MOV C,C	74	MOV M,H	9F	SBB A	CA	JZ	F5	PUSH PSW
1F	RAR	4A	MOV C,D	75	MOV M,L	A0	ANA B	CB	-	F6	ORI D8
20	RIM	4B	MOV C,E	76	HLT	A1	ANA C	CC	CZ Adr	F7	RST 6
21	LXI H,D16	4C	MOV C,H	77	MOV M,A	A2	ANA D	CD	CALL Adr	F8	RM
22	SHLD Adr	4D	MOV C,L	78	MOV A,B	A3	ANA E	CE	ACI D8	F9	SPHL
23	INX H	4E	MOV C,M	79	MOV A,C	A4	ANA H	CF	RST 1	FA	JM Adr
24	INR H	4F	MOV C,A	7A	MOV A,D	A5	ANA L	D0	RNC	FB	EI
25	DCR H	50	MOV D,B	7B	MOV A,E	A6	ANA M	D1	POP D	FC	CM Adr
26	MVI H,D8	51	MOV D,C	7C	MOV A,H	A7	ANA A	D2	JNC Adr	FD	-
27	DAA	52	MOV D,D	7D	MOV A,L	A8	XRA B	D3	OUT D8	FE	CPI D8
28	-	53	MOV D,E	7E	MOV A,M	A9	XRA C	D4	CNC Adr	FF	RST 7
29	DAD H	54	MOV D,H	7F	MOV A,A	AA	XRA D	D5	PUSH D		
2A	LHLD Adr	55	MOV D,L	80	ADD B	AB	XRA E	D6	SUI D8		

D8 = constant, or logical/arithmetic expression that evaluates to an 8-bit data quantity.

Adr = 16-bit address.

D16 = constant, or logical/arithmetic expression that evaluates to a 16-bit data quantity.