Paper B

TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

Department of Medical Engineering

UNIVERSITY EXAMINATION FOR:

Bachelor of Science in Medical Engineering

EEE 4430: Microprocessor Systems

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: SEPTEMBER 2018

TIME: 2 HOURS

DATE: SEPTEMBER 2018

Instructions to Candidates

You should have the following for this examination

-*Answer Booklet, examination pass and student ID*

This paper consists of **five** Questions; Question ONE is compulsory. In addition attempt any Other TWO Questions.

Do not write on the question paper.

QUESTION ONE

a) With the aid of a block diagram explain the functions of each of the basic parts of a microcomputer [10 marks]

b) Explain the **THREE** instruction word sizes giving **ONE** example in each case. [6 marks]

c) Explain the functions of each of the following registers:

(i) Program counter

(ii) Accumulator

(iii) Index register. [6 marks]

d) (i) Write instructions for the Intel 8085 microprocessor to perform the following tasks

(I) Load byte **5A**H in register ***C***.

(II) Exchange H and L with D and E

(III) **2080**H in register pair ***H***, ***L***.

(IV) Copy contents of register ***B*** to the Accumulator.

(ii) State and explain **TWO** instructions used with the stack. [7 marks]

QUESTION TWO

a) Explain any THREE actions taken after *opcode* has been decoded [6 marks]

b) (i) Differentiate between machine cycle and instruction cycle.

(ii) Explain the function of the following instructions.

(I) INX ***D***

(II) DAD ***B*** [6 marks]

c) Nine bytes of data are stored in memory locations at **8050**H to **8058**H.
The data bytes are: Data (H): **37**, **A2**, **F2**, **82**, **57**, **5A**, **10**, **19** and **98**.

(i) Write instructions to store the data bytes in the memory locations.

(ii) Write a program that transfers the entire block of data in (i) to new memory locations starting at **AB00**H.

[8 marks]

QUESTION THREE

a) With the aid of a diagram, explain a tri-state buffer and why it should be used in microprocessor data bus. [6 Marks]

b) State any **SIX** machine cycles in the Intel 8085 microprocessor [6 Marks]

c) Explain the functions of any FOUR status bits found in the flags register. [8 Marks]

QUESTION FOUR

(a) (i) Explain the following concepts as used in assembly language programming:

(I) Opcode

(II) Operand

(ii) Explain any **FOUR** addressing modes used in Intel 8085A microprocessor. [10 marks]

(b) i) State any THREE microprocessor operations related to data manipulation.

ii) Write an assembly language program to load the byte 8EH in register D and F7H in register E. Mask the higher order bits (D7 – D4) from both the data bytes and display the results at output PORT 1, EX-OR the lower order bits (D3 – D0) from the two registers and display the at output PORT 2. [10 marks]

QUESTION FIVE

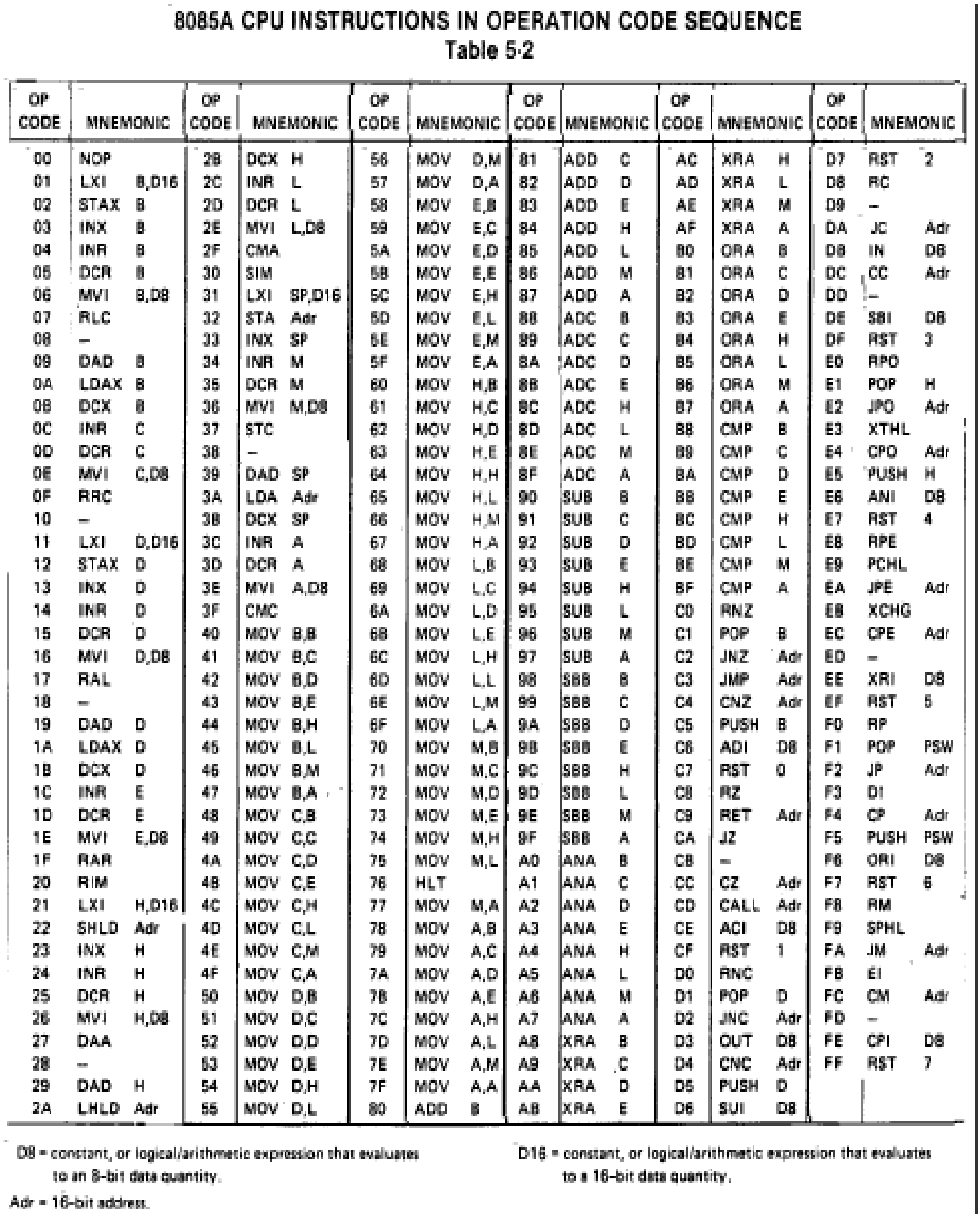
a) An 8 bit microprocessor with a 16-bit address bus requires PROM space of 4K bytes and RAM spaces of 16K bytes, occupying a continuous space. Draw the memory map of the system.

[6 marks]

b) Describe the operations undertaken by the CPU when it executes the instruction RET. [2 marks]

c) i) Write an assembly language program to multiply two 8-bit numbers – **08**H and **0C**H – and store the result in memory location **2500**H.

ii) Modify the program in (i) to include a subroutine [12 Marks]



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	2B	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.

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

Adr = 16-bit address.