TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED & HEALTH SCIENCES

DEPARTMENT OF MATHEMATICS AND PHYSICS

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN APPLIED PHYSICS

EEE 4451: MICROPROCESSOR SYSTEM & APPLICATIONS.

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2016

TIME: 2 HOURS

DATE: DECEMBER 2016

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 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 [12 marks]

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

c) 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.

v. Store a byte of data at memory location 27E5H

vi. End program execution

[6 marks]

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

(i) Program counter

(ii) Accumulator

(iii) Instruction register. [6 marks]

Question TWO

a) Distinguish between the following terminologies
   i. Top-down and bottom –up approach software systems design and implementation
   ii. Synchronous and asynchronous serial communication interface 8 marks

b) With the aid of a block diagram describe the functions of the basic elements of a general PIO interface 8 marks

c) Explain the need to carry out the following microprocessor system testing.
   i. Black box
   ii. Performance 4 marks

Question THREE

a) With the aid of a flowchart, describe the software interrupt polling approach 12 marks

b) Define the following addressing modes as applied to Intel 8085 microprocessor stating a typical example in each case
   i. Immediate
   ii. Direct
   iii. Register Indirect
   iv. Implied . 8 marks

Question FOUR

a) Explain the function of the following software development tools
   i. Assembler
   ii. Editor
   iii. Debugger 6 marks

b) Explain any FOUR functions of an interface on microprocessor based system 8 marks

c) Outline the FOUR characteristics of a fiber optic sensor. 4 marks

Question FIVE

a) Outline the FIVE phases of a modular programming process and state any THREE advantages of modular programming 8 marks

b) Let the accumulator and register D contain the value 6CH and E9H respectively, Determine the value in the accumulator after the following instructions have been executed
   i. ANA D
   ii. XRA D
   iii. ORA D 6marks

c) Define the following memory terms
   i. Memory cell
   ii. Data transfer time
   iii. Settling time
   iv. latency

8 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.