

1521/204

1601/204

MICROELECTRONICS, ELECTRICAL
PRINCIPLES II, ELECTRICAL MAINTENANCE
AND FAULT DIAGNOSIS

Oct./Nov. 2017

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

**CRAFT CERTIFICATE IN ELECTRICAL AND ELECTRONIC
TECHNOLOGY
(POWER OPTION)
MODULE II**

MICROELECTRONICS, ELECTRICAL PRINCIPLES II,
ELECTRICAL MAINTENANCE AND FAULT DIAGNOSIS

3 hours

INSTRUCTIONS TO CANDIDATES

*This paper consists of **THREE** sections; A, B and C.*

*Answer **ONE** question from section A, **THREE** questions from section B and **ONE** question from section C in the answer booklet provided.*

Maximum marks for each part of a question are as shown.

Candidates should answer the questions in English.

This paper consists of 6 printed pages.

**Candidates should check the question paper to ascertain that
all the pages are printed as indicated and that no questions are missing.**

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SECTION A: MICROELECTRONICS

Answer *ONE* question from this section.

1. (a) (i) Describe the **three** main components of a microprocessor.
- (ii) With reference to Intel 8085 microprocessor, explain the importance of the following pins on the chip package.
- I. ALE
- II. READY
- (10 marks)
- (b) State **two** advantages of assembly language over high level language programming. (2 marks)
- (c) Starting at address 3000 H, write an assembly language program that will add two decimal numbers 36748 located at memory address starting 3500 H and 38117 located at memory address starting 3502 H. The result is stored in memory starting at 3504 H. (8 marks)
2. (a) State any **three** performance features considered when selecting a memory device for a given application. (3 marks)
- (b) Explain the function of the following internal microprocessor registers:
- (i) Accumulator;
- (ii) Memory address register;
- (iii) Program counter. (6 marks)
- (c) For each of the following instructions; state the addressing mode used and its bit size.
- (i) STAX B
- (ii) LHLD 4000 H
- (iii) ADD B (6 marks)
- (d) A microcomputer has 24 address lines and 8 data lines. Determine its:
- (i) word size;
- (ii) maximum number of addressable memory locations;
- (iii) number of hexadecimal digits needed to give an address code. (5 marks)

SECTION B: ELECTRICAL PRINCIPLES II

Answer any **THREE** questions from this section.

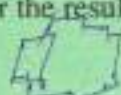
3. (a) Define the following terms as used in single phase a.c. circuits.

- (i) Cycle;
- (ii) Periodic time;
- (iii) Amplitude.

(6 marks)

- (b) Two alternating currents are represented by $i_1 = 10 \sin \omega t$ and $i_2 = 20 \sin (\omega t + \frac{\pi}{3})$.

- (i) Sketch the phasor diagram and determine the resultant current.
- (ii) Write the equation for the resultant current.



$$f_o = \frac{\omega L}{\sqrt{LC}}$$

(14 marks)

4. (a) State **four** conditions observed at resonance in a.c series circuits.

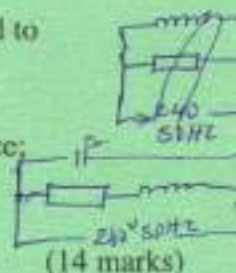
(4 marks)

- (b) Explain the term 'Quality factor' as used in parallel a.c circuits.

(2 marks)

- (c) An inductive circuit of resistance 10Ω and inductance 0.02 H is connected to 240V , 50Hz supply. Determine the:

- (i) Value of capacitor connected in parallel that will produce resonance;
- (ii) branch currents;
- (iii) supply current.



(14 marks)

5. (a) Outline **four** physical effects of electric current utilized in the operation of electrical measuring instruments.

(4 marks)

- (b) (i) With aid of a diagram, describe the construction of an electrodynamical moving coil instrument.

- (ii) State **three** applications of the instrument in b(i).

(9 marks)

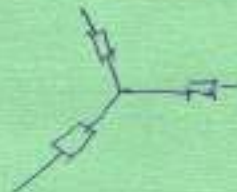
- (c) (i) Illustrate how the range of a voltmeter can be extended.

- (ii) The voltmeter in c(i) has a resistance of 15Ω and gives full scale deflection when carrying a current of 100 mA . Determine the resistance required for the instrument to read up to 0.7 kV .

(7 marks)

$$f_o = \frac{\omega L}{\sqrt{LC}}$$

6. (a) State two advantages of the interconnection of power stations for a.c power distribution.
 - maintain power been supplied over a long distance (2 marks)
- (b) (i) Draw a circuit diagram for power measurement in unbalanced load using the three-wattmeter method.
- (ii) A three phase motor driving a posho mill has a power factor of 0.5. Two wattmeters connected to measure the input power read 25 kW. Determine the reading of each wattmeter.
- (c) Three similar resistors are connected in star across a 415V, 3-phase lines. The line current is 10A. Determine the:
- (i) phase current; ✓
 (ii) phase voltage; ✓
 (iii) value of each resistor. ✓



(12 marks)

(6 marks)

SECTION C: ELECTRICAL MAINTENANCE AND FAULT DIAGNOSIS

Answer ONE question from this section.

7. (a) (i) Outline two ways in which stroboscopic effect can be dangerous.
- (ii) Illustrate how twin tube fitting of fluorescent lamps may be connected to minimize the effect in a(i) when connected to a single phase a.c supply.
- (b) (i) Describe the procedure of finding faults in underground electric cables.
- (ii) Show using a diagram the fault condition of a three core cable whose insulation resistance measurements are given as:
- Red core to earth - infinity
 Red core to yellow core - infinity
 Yellow core to earth - 100 KΩ
 Red core to blue core - infinity
 Blue core to earth - zero
 Yellow core to blue core - 100 KΩ

(10 marks)

(c) A d.c. machine was dismantled during annual maintenance and the following observed:

- (i) dirt, oil and grease on the surface;
- (ii) some parts had rusted;
- (iii) worn out ball bearings.

Outline for each, **one** remedy to be done.

(3 marks)

8. ✓ (a) State:

- (i) **five** objectives of preventive maintenance in a manufacturing company.
- (ii) **four** important functions of a preventive maintenance programme.

(9 marks)

(b) Outline **three** maintenance checks carried out for the following a.c motor faults.

- (i) Fuses blow or overload trip operates when any attempt is made to start the motor.
 - over load
 - short circuit
- (ii) Three phase motor hums but does not start.
 - single phasing
 - low voltage
- (iii) Single phase motor hums but does not start.

(9 marks)

(c) List **two** types of electrical faults occurring in electrical installation.

(2 marks)

- earth continuity

$$\sinh = \frac{e^x + e^{-x}}{e^x - e^{-x}}$$

$$\tanh = \frac{\cosh \sinh}{\cosh}$$

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

DB = 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.

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