

Name _____ Index No. _____

1521/204

Candidate's Signature _____

1601/204

**MICRO-ELECTRONICS, ELECTRICAL
PRINCIPLES II, ELECTRICAL MAINTENANCE
AND FAULT DIAGNOSIS**

Date _____

Oct/Nov 2014

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

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

**MICRO-ELECTRONICS, ELECTRICAL PRINCIPLES II,
ELECTRICAL MAINTENANCE AND FAULT DIAGNOSIS**

3 hours

INSTRUCTIONS TO CANDIDATES

Write your name and index number in the spaces provided above.

Sign and write the date of the examination in the spaces provided above.

You should have the following for this examination:

a non-programmable electronic calculator/mathematical table;

8085 instruction set.

This paper consists of TWO sections; A and B.

Answer ALL the questions in section A and any ONE question from section B in the spaces provided in this question paper.

All questions carry equal marks and maximum marks for each part of a question are as indicated.

Do NOT remove any pages from this booklet.

Candidates should answer the questions in English.

For Examiner's Use Only

Section	Question	Maximum Score	Candidate's Score
A	1	20	
	2	20	
	3	20	
	4	20	
B		20	
Total Score			

This paper consists of 24 printed pages.

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

SECTION A

Answer **ALL** the question in this section in the spaces provided.

1. (a) (i) Define the term bandwidth as used in RCL circuits;
- (ii) Show that the Q-factor for a series resonant circuit is given by:

$$Q\text{-factor} = \frac{\omega_0 L}{R}$$

where: ω_0 = angular velocity in rad/sec

L = inductance in henrys

R = resistance in ohms.

(7 marks)

- (b) A coil of inductance 0.14 H and resistance 60 ohms is connected in parallel with capacitor C across 240 V, 50 Hz a.c. supply. Determine the:

- (i) supply current;
- (ii) initial power factor without capacitor C;
- (iii) value of capacitor C that will correct the power factor to 0.9. (13 marks)

2. (a) State any **three** advantages of star connection over delta connection in three phase systems. (3 marks)

- (b) Show that active power for a three phase star connection is given by:

$$P = \sqrt{3} V_L I_L \cos\theta$$

where: V_L = line voltage

I_L = line current

$\cos\theta$ = power factor

(6 marks)

- (c) A balanced three phase delta series connected loads comprises of a 50 Ω resistor and 0.13 H inductor per phase. If the supply voltage is 415 V, 50 Hz, determine:

- (i) phase current;
- (ii) total power dissipated. (11 marks)

3. (a) State any **four** addressing modes used in microprocessor systems. (4 marks)
- (b) Describe each of the following assembly language instruction classification stating an instruction in each case:
- data transfer;
 - machine control;
 - transfer of control. (9 marks)
- (c) **Figure 1** shows a diagram of an Intel 8085 flag register.

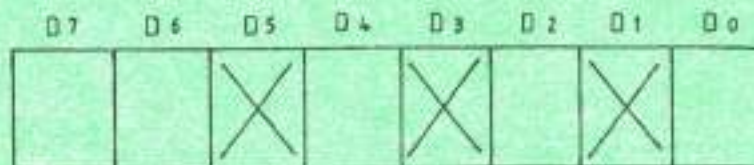


Fig. 1

- Fill in the corresponding flags from D_0 to D_7 ;
 - State the function(s) of each of the flag D_0 and D_7 . (7 marks)
4. (a) Define each of the following types of maintenance:
- preventive;
 - predictive;
 - corrective. (6 marks)
- (b) State any **three**:
- advantages of planned maintenance;
 - functions of maintenance department. (8 marks)
- (c) Explain **two** causes of the following faults in discharge lamps:
- lamp makes repeated effort to start when switched on;
 - lamp appears completely dead when first switched on, but later comes on;
 - lamp fails to start and its ends glow dull and reddish. (6 marks)

SECTION B

Answer any **ONE** question from this section in the spaces provided.

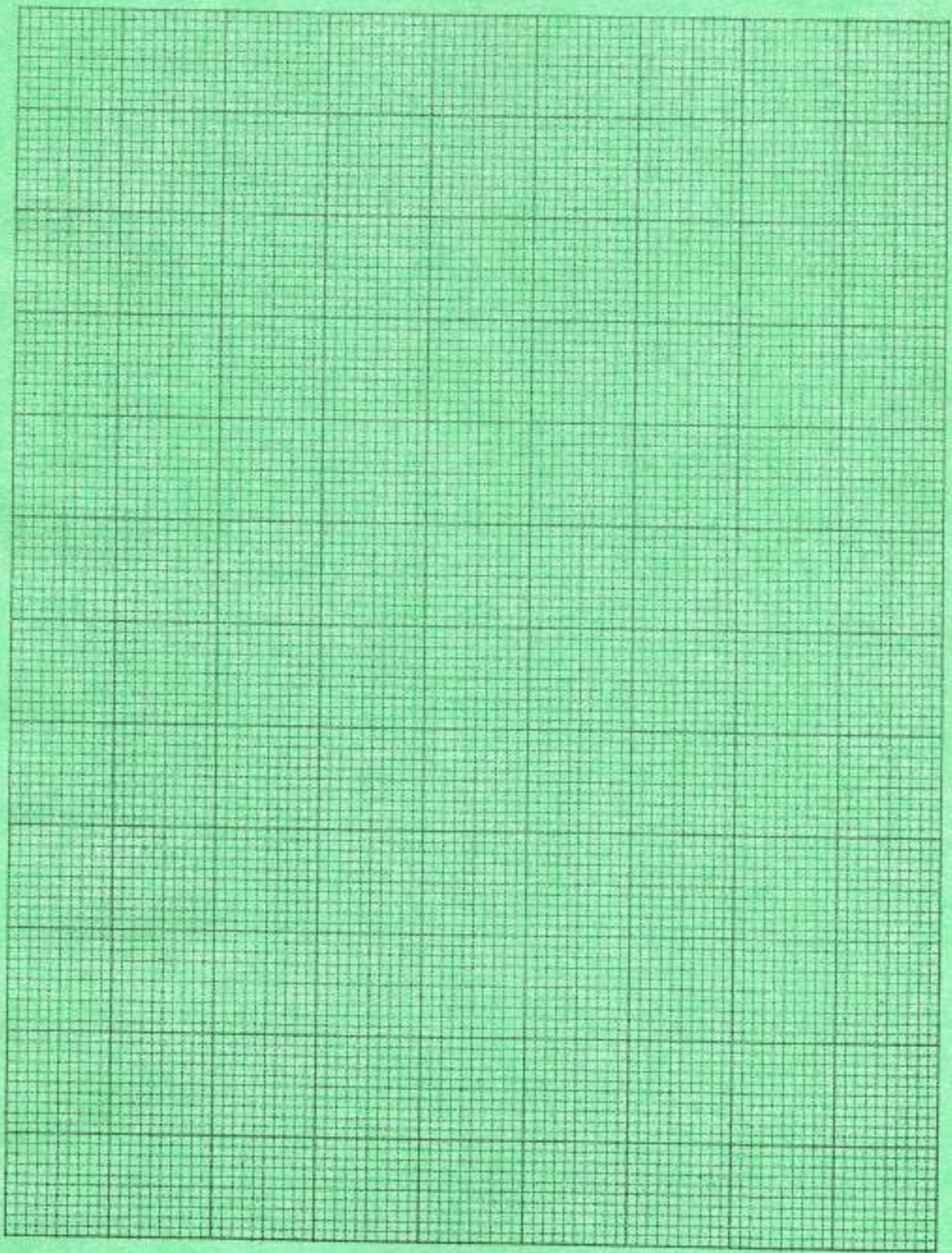
5. (a) State the areas to be checked when performing a regular mechanical inspection on a motor. (4 marks)
- (b) Explain any **three** causes of each of the following faults in DC motors:
- (i) excessive sparking at commutator;
 - (ii) brushing chattering;
 - (iii) when motor is started, the starter refuses to hold on its 'ON' position. (9 marks)
- (c) (i) Outline the procedure for assembling a motor after repair and maintenance;
- (ii) Name any **three** tests done to the motor after assembly in (c) (i). (7 marks)
6. (a) Define the following terms with respect to a.c. system:
- (i) peak value;
 - (ii) average value. (4 marks)
- (b) A moving coil instrument gives a full scale deflection when the current is 60 mA and its resistance is 30 Ω . Calculate the value of the shunt resistor that will enable the instrument to measure a current of 50 A. (6 marks)
- (c) The following AC currents flow into a junction:
- $$i_1 = 40 \sin\left(\omega t + \frac{12}{25}\pi\right)$$
- $$i_2 = 60 \sin\left(\omega t - \frac{2\pi}{9}\right)$$
- Determine the:
- (i) resultant current leaving the junction in the form of $i_r = A \sin(\omega t \pm \theta)$;
 - (ii) root mean square value of the resultant current. (10 marks)

7. (a) (i) Define each of the following terms with reference to memories:
- I memory cell;
 - II memory word.
- (ii) The specification of a memory device is given as $2k \times 8$. Determine the:
- I total number of words;
 - II word size;
 - III total number of bits (capacity);
 - IV size of address bus. (12 marks)
- (b) Table 1 shows an assembly language program and its corresponding machine code. Fill in the missing information. (8 marks)

Table 1

Memory		Assembly			Comment
Address	Content	Mnemonic	OP ₁	OP ₂	
2003	3E	MVI	A	—	(A) ← FE _(HEX)
2004	FE				
2005	—	MOV	—	A	(B) ← (A)
2006	4F	—	C	A	
2007	21	—	H	—	(H) (L) ← 802 D _(HEX)
2008	2D				
2009	80				
—	EB	XCHG			(D) (E) → (H) (L)

8. (a) (i) Define a service manual as used in maintenance of equipment;
- (ii) List any **three** contents of a service manual. (5 marks)
- (b) State any **six** factors to be considered when planning for a maintenance programme for machines and equipment in a factory. (6 marks)
- (c) A technician observed the following symptoms on an a.c. machine. For each symptom, state any **three** checks performed to identify each fault:
- (i) three phase motor hums but refuses to start;
 - (ii) when motor is started, fuses blow and overload trip operates immediately;
 - (iii) single phase motor hums but refuses to start. (9 marks)



Instruction set of

8080/8085

OP CODE	MNEMONIC	OP CODE	MNEMONIC	OP CODE	MNEMONIC	OP CODE	MNEMONIC	OP CODE	MNEMONIC	OP CODE	MNEMONIC
00	NOV	28	DCX H	56	MOV D,M	84	ADD C	AC	XRA H	D7	RST 2
01	LXI B,D16	2C	INR L	57	MOV D,A	85	ADD D	AD	XRA L	D8	RC
02	STAX B	2D	DCR L	58	MOV E,B	86	ADD E	AE	XRA M	D9	—
03	INX B	2E	MVI L,DB	59	MOV E,C	87	ADD H	AF	XRA A	DA	JC Adr
04	INR B	2F	CMA	5A	MOV E,D	88	ADD L	B0	ORA B	DB	IN DB
05	DCR B	30	SIM	5B	MOV E,E	89	ADD M	B1	ORA C	DC	CC Adr
06	MVI B,DB	31	LXI SP,D16	5C	MOV E,H	8A	ADD A	B3	ORA D	DD	—
07	RLC	32	STA Adr	5D	MOV E,L	8B	ADC B	B3	ORA E	DE	SBI DB
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,DB	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	CMF B	E3	XTHL
0D	DCR C	38	—	63	MOV H,E	8E	ADC M	B9	CMF C	E4	CPO Adr
0E	MVI C,DB	39	DAD SP	64	MOV H,H	8F	ADC A	BA	CMF D	E5	PUSH H
0F	RRC	3A	LDA Adr	65	MOV H,L	80	SUB B	BB	CMF E	E6	ANI DB
10	—	3B	DCX SP	66	MOV H,M	91	SUB C	BC	CMF H	E7	RST 4
11	LXI D,D16	3C	INR A	67	MOV H,A	92	SUB D	BD	CMF L	E8	RPE
12	STAX D	3D	DCR A	68	MOV L,B	93	SUB E	BE	CMF M	E9	PCHL
13	INX D	3E	MVI A,DB	69	MOV L,C	94	SUB H	BF	CMF 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,DB	41	MOV B,C	6C	MOV L,H	97	SUB A	C2	JNZ Adr	ED	—
17	BAL	42	MOV B,D	6D	MOV L,L	98	SBB B	C3	JMP Adr	EE	ERI DB
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 DB	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,DB	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 DB
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 M,B	A3	ANA E	CE	ACI DB	F9	SPHL
23	INX H	4E	MOV C,M	79	MOV M,C	A4	ANA H	CF	RST 1	FA	JM Adr
24	INR H	4F	MOV C,A	7A	MOV M,D	A5	ANA L	D0	RNC	FB	EI
25	DCR H	50	MOV C,B	7B	MOV M,E	A6	ANA M	D1	POP D	FC	CM Adr
26	MVI H,DB	51	MOV C,C	7C	MOV M,H	A7	ANA A	D2	JNC Adr	FD	—
27	DAA	52	MOV C,D	7D	MOV M,L	A8	XRA B	D3	OUT DB	FE	CPI DB
28	—	53	MOV C,E	7E	MOV M,M	A9	XRA C	D4	CNC Adr	FF	RST 7
29	DAD H	54	MOV C,H	7F	MOV M,A	AA	XRA D	D5	PUSH D		
2A	LHLD Adr	55	MOV C,L	80	ADD B	AB	XRA E	D6	SUI DB		

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.