

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:  $\omega_0$  = 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  $\Omega$  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.

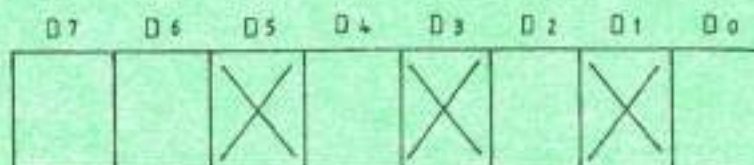


Fig. 1

- 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.

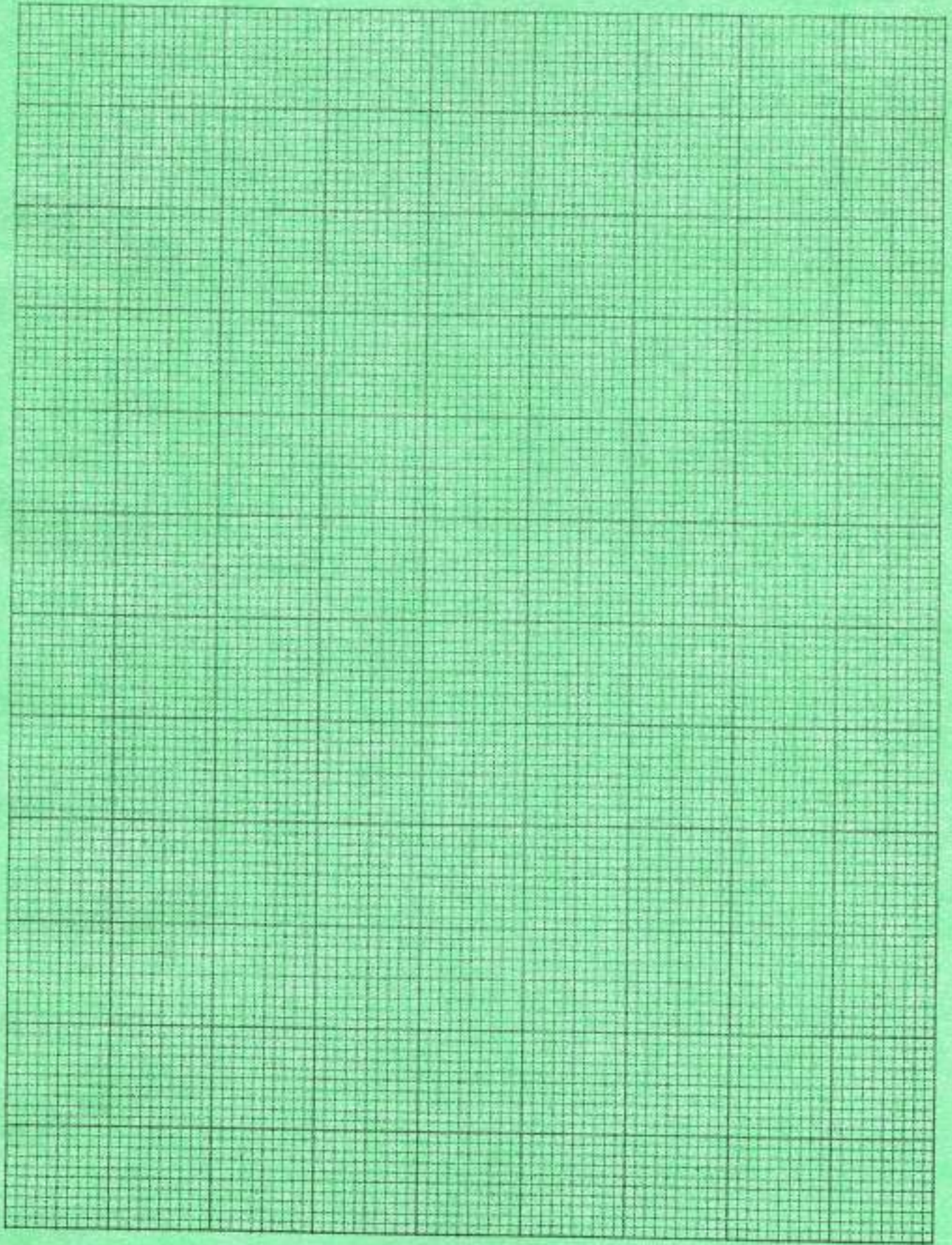
5. (a) State the areas to be checked when performing a regular mechanical inspection on a motor. (4 marks)
- (b) Explain any **three** causes of each of the following faults in DC motors:
- excessive sparking at commutator;
  - brushing chattering;
  - when motor is started, the starter refuses to hold 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:
- peak value;
  - 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  $\Omega$ . 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:
- resultant current leaving the junction in the form of  $i_r = A \sin(\omega t \pm \theta)$ ;
  - 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 <sub>1</sub>	OP <sub>2</sub>	
2003	3E	MVI	A	—	(A) ← FE <sub>(HEX)</sub>
2004	FE				
2005	—	MOV	—	A	(B) ← (A)
2006	4F	—	C	A	
2007	21	—	H	—	(H) (L) ← 802 D <sub>(HEX)</sub>
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	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,DB	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 DB
05	DCR B	30	SIM	5B	MOV E,E	86	ADD M	B1	ORA C	DC	CC Adr
06	MVI B,DB	31	LXI SPD10	5C	MOV E,H	87	ADD A	B3	ORA D	DD	—
07	RLC	32	STA Adr	5D	MOV E,L	88	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	90	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	CB	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	RAL	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.