THE KENYA NATIONAL EXAMINATIONS COUNCIL

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

ELECTRICAL INSTALLATION II, ESTIMATING
AND TENDERING, INDUSTRIAL MACHINES AND CONTROLS

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:
   A non-programmable scientific calculator/mathematical tables;
   Answer booklet.
*This paper consists of **THREE** sections; A , B and C.*
*Answer **TWO** questions from section A, **ONE** question from section B and **TWO** questions from section C.*
All questions carry equal marks.
Maximum marks for each part of a question are as indicated.
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.

SECTION A: ELECTRICAL INSTALLATION II

*Answer **TWO** questions from this section.*

1. (a) Explain each of the following types of wiring systems:

    (i) HSOS;
    (ii) Earthed concentric wiring.

    (4 marks)·

   (b) (i) Distinguish between block rate and two part tariff;
       (ii) A capacitor rated 20 KVAR is used to correct the power factor of a single phase 240 V, 50Hz circuit. Determine the capacitance of the capacitor.

    (9 marks)

   (c) (i) State **three** IEE regulation requirements for conduit installations in flame-proof areas;
       (ii) Name **four** construction materials which cause corrosion.

    (7 marks)

2. (a) (i) State **three** merits of mineral insulated copper sheathed cables.
       (ii) List **two** precautions observed when using paper insulated lead sheathed cables.

    (5 marks)

   (b) Table 1 shows rating factors and estimated minimum size of trunking for specified number of cables of given sizes. Using the table, determine the size of trunking necessary to accommodate the following:

    (i) 20 cables of 1.78 mm size rubber insulated and 6 cables of 1.35 mm size pvc insulated;

    (ii) 60 cables of 1.38 mm size and 120 cables of 1.04 mm size all pvc insulated.

    (10 marks)

   Table 1

Cable Size	Factor			Trunking size
	Rubber	PVC	Capacity	
1/1.13	13	14	1000	38 x 38 mm
1/1.38	17	18	1350	50 x 38 mm
1/1.78	21	21	1800	50 x 50 mm
7/0.85	23	24	2000	75 x 38 mm
7/1.04	33	33	2700	75 x 50 mm
7/2.14	100	88	4050	150 x 38 mm
19/1.53	179	162	5400	150 x 50 mm
19/1.78	-	-	7200	100 x 100 mm

   (c) With aid of a circuit diagram, explain the operation of a bell-relay. (5 marks)

3. (a) Figure 1, shows a types of wiring system.

     (i) Identify the wiring system.

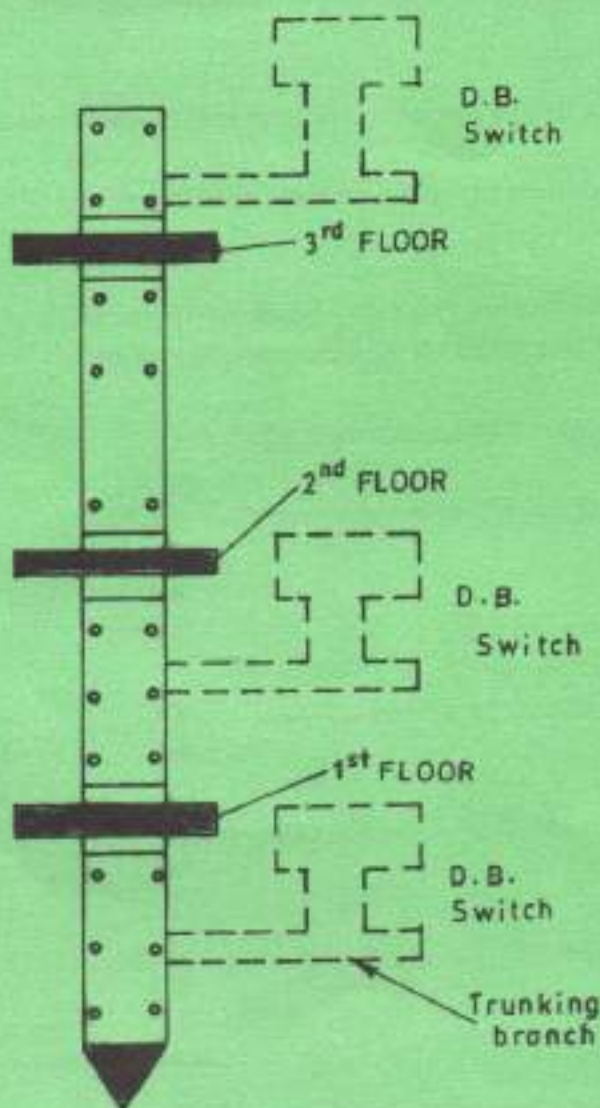   (ii) State **one** application of this type of wiring.   (2 marks)

Figure 1

(b) (i) State the conditions that are necessary for corrosion to take place.

     (ii) With aid of a diagram, explain the sacrificial anode method of cathodic protection   (8 marks)

(c) Outline **three** reasons why farm and horticultural installations are categorized as special installations.   (3 marks)

(d) (i) State **two** demerits of the open type fire alarm system.

     (ii) List **three** types of indicator elements used in electric bells.

     (iii) Explain the reason why automatic fire detectors should be installed away from direct sunlight, hot pipes or heating appliances.

           (7 marks)

SECTION B: ESTIMATING AND TENDERING

Answer ONE question from this section.

4. (a) Define Luminous Intensity with respect to illumination and state standard unit.

    (2 marks)

    (b) With aid of a diagram, derive the inverse square law of illuminance.   (7 marks)

    (c) Outline **three** steps considered when planning interior lighting of a workshop.

    (3 marks)

    (d) Single energy saving lamps are fixed 400 cm above the working plane to illuminate a staff room measuring 16 x 12 m. If the space height ratio is 1:

    (i) Estimate the number of lamps required;

    (ii) Using a scale drawing, show the locations of the lamps.

    (8 marks)

5. (a) (i) Explain the term 'contract'.

    (ii) Outline **six** essentials of a valid contract.

    (8 marks)

    (b) Explain the following remedies for breach of contract:

    (i) quantum merit;
    (ii) specific performance;
    (ii) injunction.

    (6 marks)

    (c) Name **four** contract documents for a building project.   (4 marks)

    (d) List **two** ways of terminating a contract entered between two parties.   (2 marks)

*Answer **TWO** questions from this section.*

6. (a) State the function of each of the following in a d.c machine:

   (i) stator;

   (ii) rotor. (2 marks)

   (b) (i) Explain the need for motor enclosures;

   (ii) Name **two** types of motor enclosures. (4 marks)

   (c) Outline the sequence of lining up a belt-drive between two machines. (4 marks)

   (d) (i) Draw a labelled diagram of a three-stud d.c plate starter.

   (ii) Explain the functions of:

   (I) thermal overload coil;

   (II) No-volt release coil.

   (10 marks)

7. (a) Compare Induction to Synchronous motors with regard to the factors indicated in table 2. (4 marks)

   Table 2

Factor	Induction motor	Synchronous motor
Speed		
Starting		
Power factor		
Maintenance cost		

   (b) Draw a labelled diagram of a pony motor method of starting a three phase synchronous motor. (7 marks)

   (c) (i) Explain the procedure of reversing a three phase motor rotation.

   (ii) State **two** methods of speed control for a three phase Induction motor.

   (4 marks)

(d)   (i)   Draw a labelled block diagram of an instrumentation system.

       (ii)   State **two** advantages of the magnetic tape recorder.   (5 marks)

8.   (a)   State **three** tests carried out on a motor control panel upon installation.
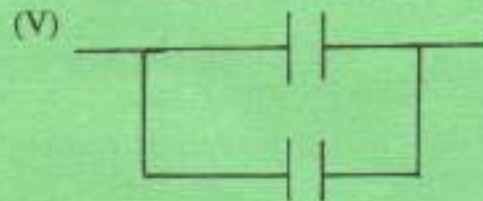
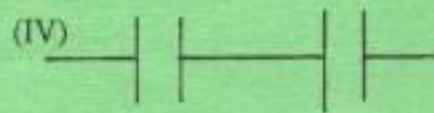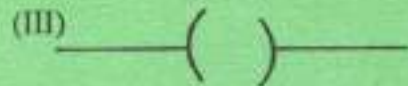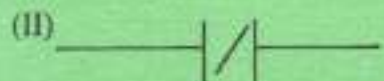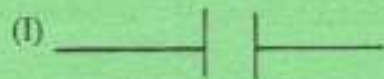   (3 marks)

   (b)   (i)   List **two** output devices used in programmable logic controllers (PLC).

       (ii)   State the **four** stages of operation of a PLC.

       (iii) State the meaning of the following symbols used in PLC ladder programming.

                                              (11 marks)

   (c)   Draw a labelled Torque versus armature (curve) characteristic for a d.c series motor.

                                                (4 marks)

   (d)   State **two** applications of the shaded pole single phase induction motor.

                                              (2 marks)

THIS IS THE LAST PRINTED PAGE.