

1521/205

1601/205

**ELECTRICAL INSTALLATION II,
ESTIMATING AND TENDERING,
INDUSTRIAL MACHINES AND
CONTROL**

June/ July 2022

Time: 3 hours



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 CONTROL**

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

A non-programmable scientific calculator/ mathematical tables;

Answer booklet;

Drawing instrument.

*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 in the answer booklet provided*

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) Define "wiring system". (2 marks)
- (b) Explain each of the following factors considered when selecting a wiring system for an installation:
- (i) cost;
 - (ii) safety.
- (4 marks)
- (c) Describe each of the following types of wiring systems:
- (i) underfloor ducts;
 - (ii) trunking.
- (6 marks)
- (d) Figure 1 shows a wiring system.

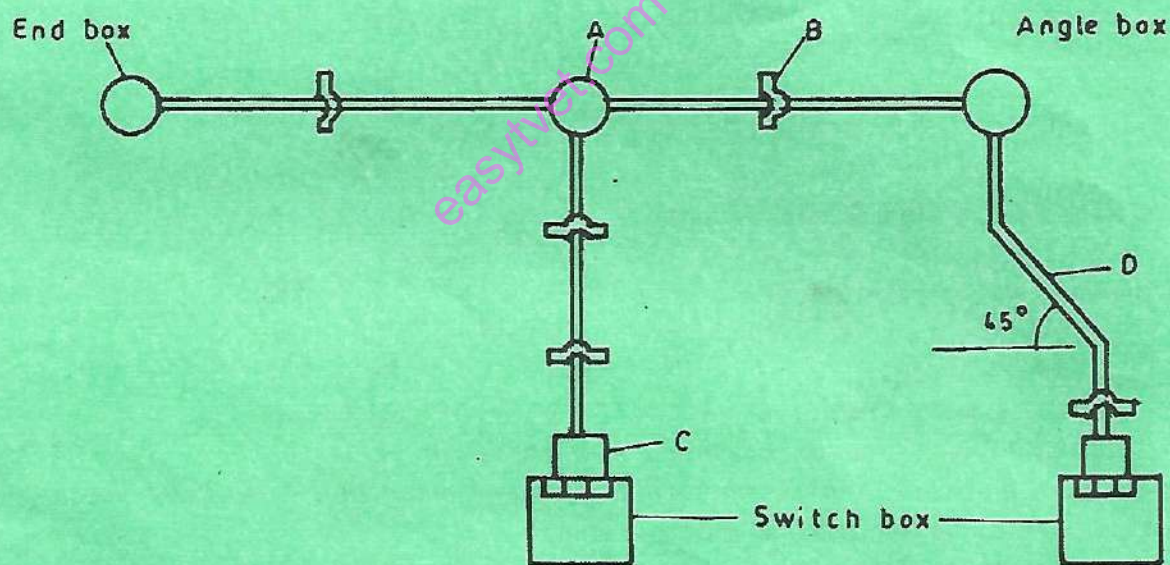


Fig.1

- (i) Identify the type of wiring system.
- (ii) Name the parts labelled A, B, C and D.
- (iii) State **three** I.E.E regulations regarding the wiring system.

(8 marks)

2. (a) (i) Explain the following types of electricity tariffs:
- (I) two part tariff;
 - (II) flat rate tariff.
- (ii) Outline **three** qualities of a good tariff. (7 marks)
- (b) State **three** merits of high power factor to consumers. (3 marks)
- (c) A factory is loaded daily as follows:
250 kW for 2 hours per day
100 kW for 8 hours per day

The charge for energy is Ksh 10 per kW of maximum demand plus 10 cents per unit.
The factory operates 5 days per week and 50 weeks per year.

Determine the:

- (i) Annual cost of units;
(ii) Total annual cost. (5 marks)
- (d) Draw the layout of supply intake point with a busbar trunking system supplying motor and lighting circuits. (5 marks)
3. (a) Explain each of the following as used in special installations:
- (i) damp situation;
 - (ii) division O. (4 marks)
- (b) Illustrate motor installation in division O area as per I.E.E regulation requirement. (4 marks)
- (c) (i) Describe 'fire alarm system'.
(ii) State **two** applications of fire alarm in a building. (6 marks)
- (d) Draw a labelled diagram of a relay-based open circuit burglar alarm system. (6 marks)

SECTION B: ESTIMATING AND TENDERING

Answer *ONE* question from this section.

4. (a) With reference to engineering contracts, explain:
- (i) the term 'estimate'.
 - (ii) primary function of an estimate.
- (4 marks)
- (b) Explain each of the following with reference to 'taking off' materials from electrical drawings:
- (i) numbered items;
 - (ii) measured items.
- (4 marks)
- (c) (i) Define the term 'tender'.
- (ii) Describe:
- (I) open tendering;
 - (II) negotiated tendering.
- (6 marks)
- (d) Outline **six** ways an offer of an electrical contract can be terminated. (6 marks)
5. (a) Explain each of the following as used in illumination:
- (i) lumen;
 - (ii) utilization;
 - (iii) space height ratio.
- (6 marks)
- (b) A lamp suspended 3 metres above the working plane has illumination of 70 lux. Determine the:
- (i) lamp lumen output at point A just below it;
 - (ii) illumination received at point B, 4 metres away from point A.
- (5 marks)
- (c) Explain:
- (i) the stroboscopic effect;
 - (ii) **two** methods of minimizing the effect in c(i).
- (5 marks)
- (d) Draw a labelled diagram of a mercury vapour lamp. (4 marks)

SECTION C: INDUSTRIAL MACHINES AND CONTROL

Answer **TWO** questions from this section.

6. (a) State **four** types of motor enclosures. (4 marks)
- (b) (i) Draw a labelled schematic diagram of a series d.c motor.
(ii) Describe the principle of operation of the motor in b(i). (6 marks)
- (c) List **four** component parts of a contactor control system. (4 marks)
- (d) Draw a labelled power circuit diagram of the star-delta starter for a three phase induction motor. (6 marks)
7. (a) Name **four** methods of speed control of three phase induction motor. (4 marks)
- (b) (i) Explain 'under voltage'.
(ii) State the effects of under voltage in (b)(i). (4 marks)
- (c) With aid of a labelled schematic diagram, explain the operation of an electromagnetic relay. (7 marks)
- (d) List:
(i) **three** standards observed when wiring machines;
(ii) **two** tests done on installed electrical machine for proper operation. (5 marks)
8. (a) State **four** demerits of analogue tape recorders. (4 marks)
- (b) With aid of a labelled block diagram, describe the elements of an instrumentation system. (9 marks)
- (c) Explain each of the following with reference to programmable logic controllers (PLCs):
(i) input address;
(ii) shift address. (4 marks)

(d) **Figure 2** shows a ladder logic diagram. Describe its operation.

(3 marks)

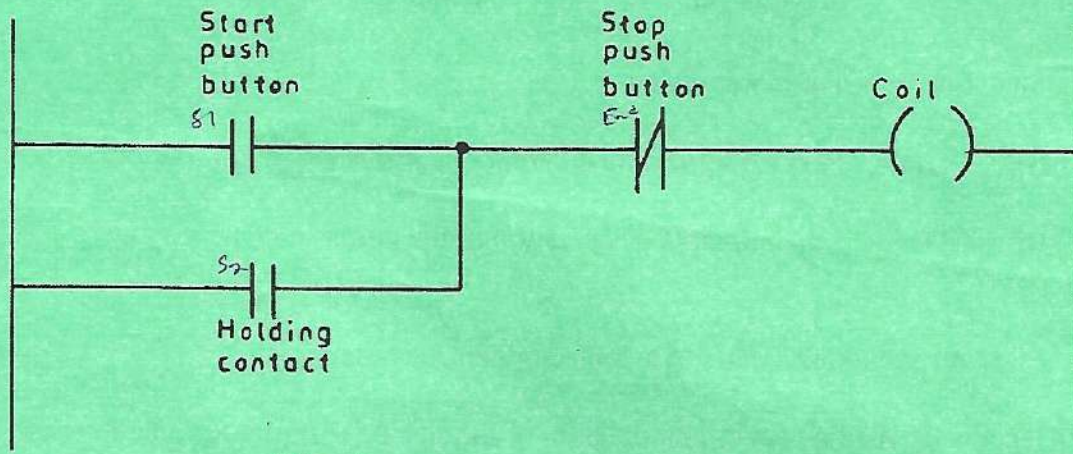


Fig. 2

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