1521/205
1601/205
ELECTRICAL INSTALLATION II, ESTIMATING AND TENDERING, INDUSTRIAL MACHINES AND CONTROLS
June/July 2020
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 CONTROLS

3 hours

INSTRUCTIONS TO CANDIDATES

You should have a non-programmable electronic calculator/mathematical tables for this examination.
*This paper consists **TWO** sections; **A** and **B**.*
*Answer any **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 5 printed pages.

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

Turn over

SECTION A: ELECTRICAL INSTALLATION II

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

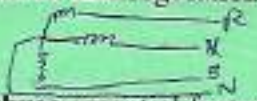
1. (a) Define 'wiring systems'. (2 marks)

   (b) Explain each of the following factors considered when selecting a particular wiring system of a house:

   (i) cost;
   (ii) accessibility;
   (iii) durability (6 marks)

   (c) With aid of labelled diagram, describe the overhead trunking wiring system for a workshop. (6 marks)

   (d) Outline **three** IEE regulation requirements regarding conduit wiring system. (6 marks)



2. (a) Outline **three** essential features of every consumer's supply intake point as required by the IEE regulations. (3 marks)

   (b) Illustrate a three-phase four-wire industrial supply for single and three phase loads. (5 marks)

   (c) Explain the following types of electric tariffs:

   (i) off-peak tariff;
   (ii) maximum demand tariff. (4 marks)

   (d) A factory has a maximum demand of 2400 KVA at a power factor of 0.8 lagging. The tariff is Ksh 200 per KVA of maximum demand. Determine the annual saving in electricity charge if the power factor is improved to 0.9 lagging. (8 marks)

3. (a) State **three** types of hazards that may be encountered in electrical installations. (3 marks)

   (b) Describe flame-proof equipment. (3 marks)

   (c) Explain **two** IEE regulation requirements regarding temporary installations. (4 marks)

   (d) (i) Differentiate between manual and automatic call points.
   (ii) Draw a labelled diagram of a single stroke bell. (10 marks)

SECTION B: ESTIMATING AND TENDERING

*Answer **ONE** question from this section.*

4. (a) Explain each of the following as used in illumination:

(i) luminous flux;
(ii) uniform point source of light. (2 marks)

(b) With the aid of a diagram, derive the expression for the consine law of illumination. (8 marks)

(c) A hall measuring 36 m x 12 m is to be illuminated by 150 watts lamps. Illumination required is 60 lux. The lamp efficiency is 15.15 lumen/watt; depreciation factor is 1.3 and utilization factor is 0.5:

(i) Determine the number of lamps required;
(ii) Sketch the layout of the lamps. (10 marks)

5. (a) Explain:

(i) estimation in relation to construction projects;
(ii) measurement as used in (a) (i). (4 marks)

(b) A product is produced by an industry in batches. The direct material cost is Ksh 16,000 and labour cost is Ksh 20,000. Factory oncost is 20% of the total material cost and labour cost. Overhead charges are 12% of the factory cost. Determine the:

(i) prime cost;
(ii) total cost of production. (10 marks)

(c) (i) Explain the term 'tender'.
(ii) List **four** types of tender documents in an electrical installation project. (6 marks)

SECTION C: INDUSTRIAL MACHINES AND CONTROLS

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

6. (a) With aid of a circuit diagram, explain the operation of a d.c series motor. (6 marks)

(b) (i) State **three** merits of three phase induction motor.
(ii) A 4-pole three phase induction motor operated from a 60 Hz supply runs at a speed of 1750 rpm. Determine its slip. (9 marks)

(c) Illustrate the direct on line starter for a three phase induction motor. (5 marks)

7. (a) Explain the function of each of the following motor control devices:

(i) thermal relays:
(ii) electromagnetic contactor. (4 marks)

(b) (i) Draw a labelled circuit diagram of the ward Leonard speed control method.
(ii) State **four** disadvantages of the ward Leonard speed control method over electronic speed control method. (10 marks)

(c) Explain how each of the following should satisfy the requirements of installation and mounting of motors:

(i) foundation;
(ii) alignment;
(iii) coupling. (6 marks)

8. (a) List **three**:

(i) tests carried out on industrial control panels;
(ii) components found in industrial control panels; (6 marks)

(b) Draw a labelled block diagram of a programmable logic control system. (5 marks)

(c) Figure 1 shows a ladder diagram for moving pneumatic piston. Write the ladder logic instruction listing. (9 marks

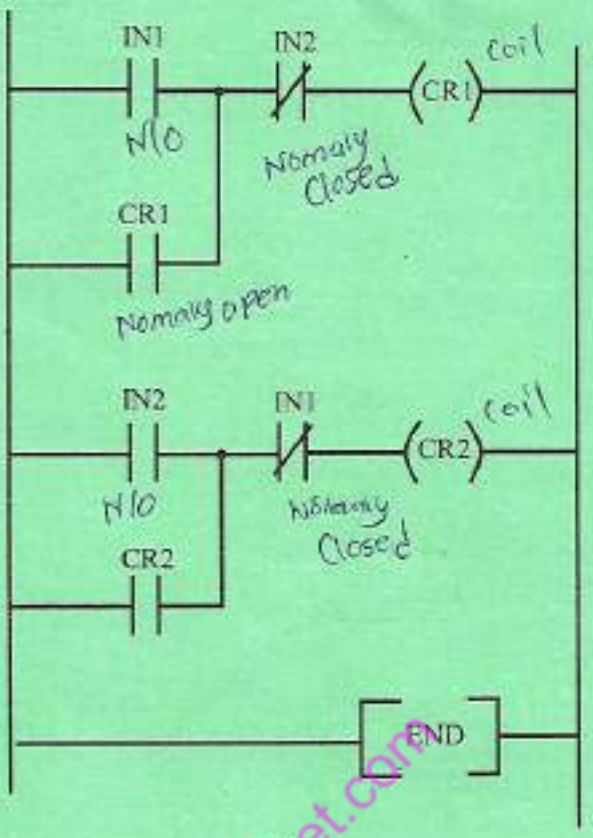


Fig. 1

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