1521/205
1601/205
ELECTRICAL INSTALLATION II ESTIMATING AND TENDERING, INDUSTRIAL MACHINES AND CONTROLS
Oct./Nov. 2016
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 **THREE** questions from Section A and **TWO** questions from section **B** in the answer booklet provided.*
All questions carry equal marks.
Maximum marks for each part of a question are as shown.
Candidates should answer the questions in English.

This paper consists of 4 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 any **THREE** questions from this section.*

1. (a) (i) Explain the term 'wiring system' as used in electrical installation works.

(ii) State **four** factors considered when selecting a particular wiring system for a building. (7 marks)

(b) (i) List **four** merits of using plastic conduits.
(ii) State **three** IEE regulation requirements when installing conduits in normal installations. (7 marks)

(c) Describe the following types of wiring systems:

(i) Catenary system;
(ii) Earthed-concentric system. (6 marks)

2. (a) (i) State **four** types of electricity tariffs applicable to consumers.

(ii) A factory consumes 1,200,000 units of electricity per year. In addition to this, there is a maximum demand (MD) of 1200 KVA. The units charge is Ksh. 16 each and the maximum demand is Ksh 110 per KVA. If the consumer's power factor is 0.6; determine the overall charge per unit. (12 marks)

(b) Explain the effects:

(i) low power factor;
(ii) high power factor. (2 marks)

(c) Draw a labelled wiring diagram of a three phase supply in correct sequence at consumer's intake point. (6 marks)

3. (a) Explain the following types of motor enclosures:

(i) open machine;
(ii) screen ventilated. (4 marks)

(b) Describe the principles of operation of a three phase a.c. induction motor. (4 marks)

(c) A 400 V d.c. shunt motor has armature resistance of 0.68 Ω and full load armature current of 32A.

(i) Sketch the equivalent circuit of the motor;
(ii) Determine the back emf developed. (4 marks)

(d) Draw a labelled circuit diagram of a direct on line automatic starter with remote control for a three phase induction motor. (8 marks)

4. (a) (i) State **two** advantages of electronic speed control of motors.
(ii) With aid of a diagram, explain the operation of electromagnetic contactors. (10 marks)

(b) Outline **four** tests carried out on electrical machines after installation. (4 marks)

(c) Describe the following terms as used in electrical machines installation:

(i) mounting;
(ii) coupling. (6 marks)

5. (a) State **four** objectives of purchasing. (4 marks)

(b) Outline **six** principles of estimating. (6 marks)

(c) Explain the following in relation to estimating:

(i) Overhead costs;
(ii) Prime cost sums;
(iii) Provisional sums. (6 marks)

(d) State **four** types of tendering that can be adopted by an organisation. (4 marks)

SECTION B

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

6. (a) State **three** main types of hazards encountered in electrical installations in hazardous areas. (3 marks)

(b) (i) Distinguish between a caravan and caravan site.
(ii) State **three** important requirements of an electrical installation of a caravan. (5 marks)

(c) Name **four** construction materials which cause corrosion. (4 marks)

(d) With aid of a diagram, explain the operation of a continuous ringing bell. (8 marks)

7. (a) Outline **four** tests carried out on completed industrial control panels. (4 marks)

(b) Using a 5 × 7 dot matrix, show how alphanumeric characters A, B are displayed. (4 marks)

(c) (i) Draw a labelled block diagram of a programmable logic controller (PLC).
(ii) Explain the functions of a central processing unit in PLC. (9 marks)

(d) Figure 1 shows an LED display circuit. Create the equivalent ladder logic circuit. (3 marks)

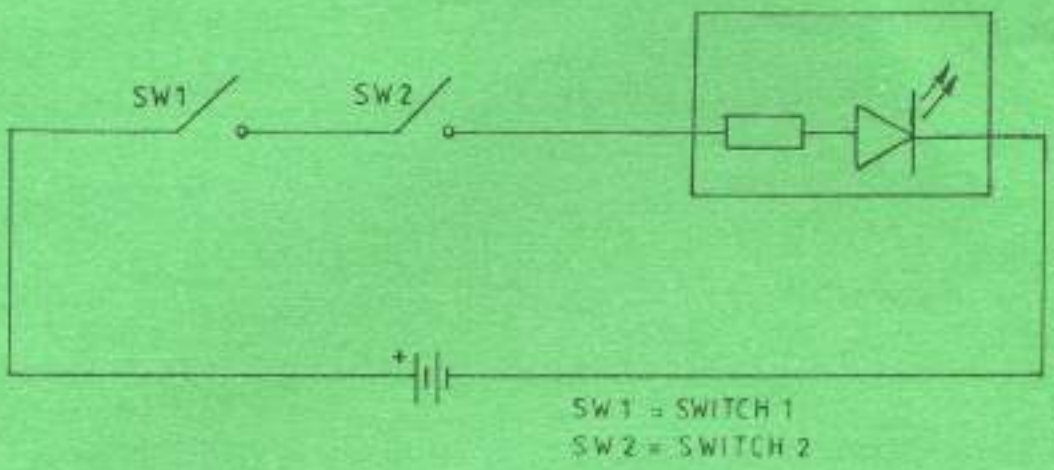

Fig. 1

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

(i) utilization factor;
(ii) room index;
(iii) glare. (6 marks)

(b) A hall measuring 30 m × 15 m is illuminated by lamps mounted 5 m above the working plane. Assuming the space height ratio is unity:

(i) estimate the number of lamps required to illuminate the hall;
(ii) sketch the arrangement of the lamps. (10 marks)

(c) Draw installation symbols for each of the following:

(i) 1 gang 2 way switch;
(ii) single switched socket outlet. (4 marks)

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