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:

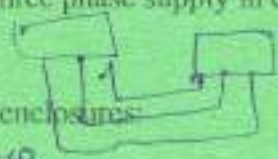   (i)   low power factor;

        (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;
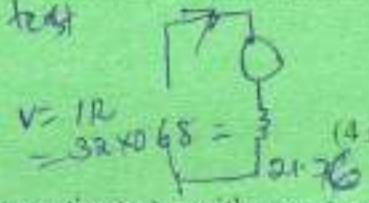
        (ii)   screen ventilated.   (4 marks)

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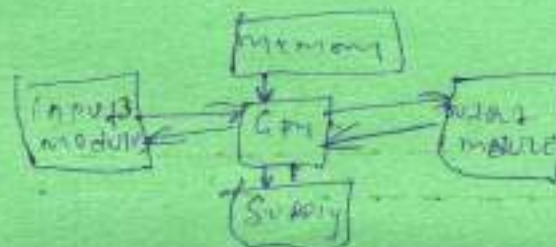
(d) Figure 1 shows an LED display circuit. Create the equivalent ladder logic circuit. (3 marks)

SW 1 = SWITCH 1
SW 2 = SWITCH 2
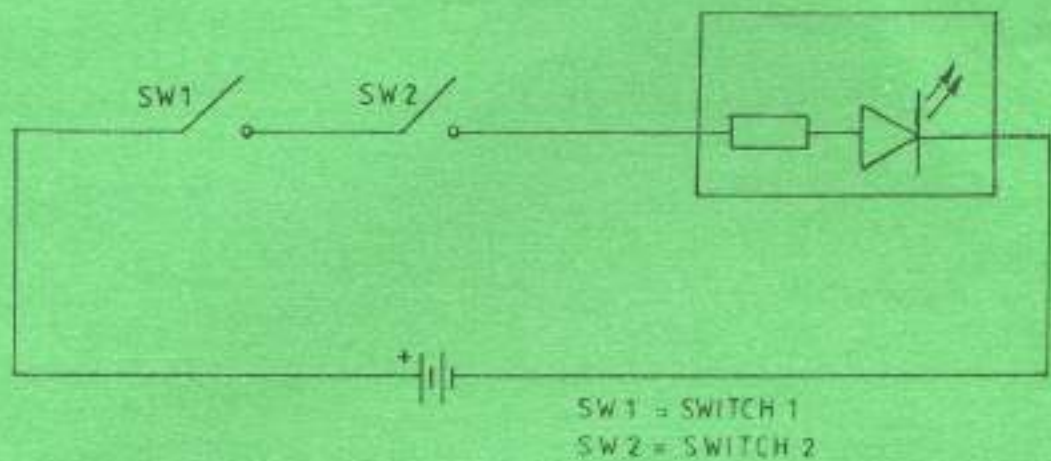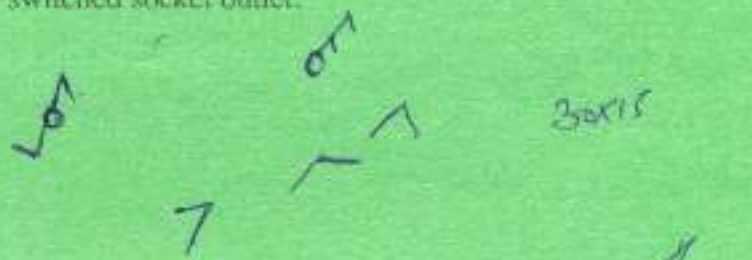
Fig. 1

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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