

1521/205

1601/205

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

June/July 2021

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:

Answer booklet;

Mathematical tables/Non-programmable scientific calculator.

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 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.

SECTION A: ELECTRICAL INSTALLATION II

Answer **TWO** questions from this section.

1. (a) State **four** merits of steel conduit wiring system. (4 marks)
 - (b) Explain each of the following factors considered when selecting a wiring system for a particular application:
 - (i) flexibility;
 - (ii) appearance;
 - (iii) operating conditions. (6 marks)
 - (c) State **two** IEE regulations requirements regarding trunking wiring systems. (4 marks)
 - (d) (i) Illustrate the underfloor duct wiring system with an inspection box.
(ii) State **two** advantages of plastic conduits over metallic conduits. (6 marks)
2. (a) List **four** control equipment at the consumers intake supply point for a three phase supply. (4 marks)
 - (b) Draw a labelled diagram showing termination of three phase supply energy meter. (4 marks)
 - (c) Outline **four** qualities of a good electricity tariff. (4 marks)
 - (d) A consumer has a maximum demand of 1200 kVA at 0.82 power factor lagging. The annual load factor is 65%. The tariff is Ksh 120 per kVA of maximum demand plus Ksh 2 per limit. Determine the annual electricity bill. (8 marks)
3. (a) Differentiate between division 0 and division I in relation to special installations. (4 marks)
 - (b) List **five** types of construction materials that cause corrosion. (5 marks)
 - (c) Explain 'intrinsically safe circuit' in relation to special installation. (2 marks)
 - (d) (i) State **three** types of sounders used in alarm systems.
(ii) With aid of a diagram, explain the operation of a closed burglar alarm system. (9 marks)

SECTION B: ESTIMATING AND TENDERING

Answer ONE question from this section.

4. (a) State two:
- (i) main reasons for providing emergency supplies in electrical installations.
 - (ii) types of emergency lighting schemes in (a)(i). (4 marks)
- (b) Draw a labelled schematic diagram of high pressure mercury vapour lamp. (7 marks)
- (c) Explain 'maintenance factor' as used in illumination. (2 marks)
- (d) Figure 1 shows two lamps A and B of luminous intensities 250 cd and 400 cd respectively. Determine the illumination at point Z. (7 marks)

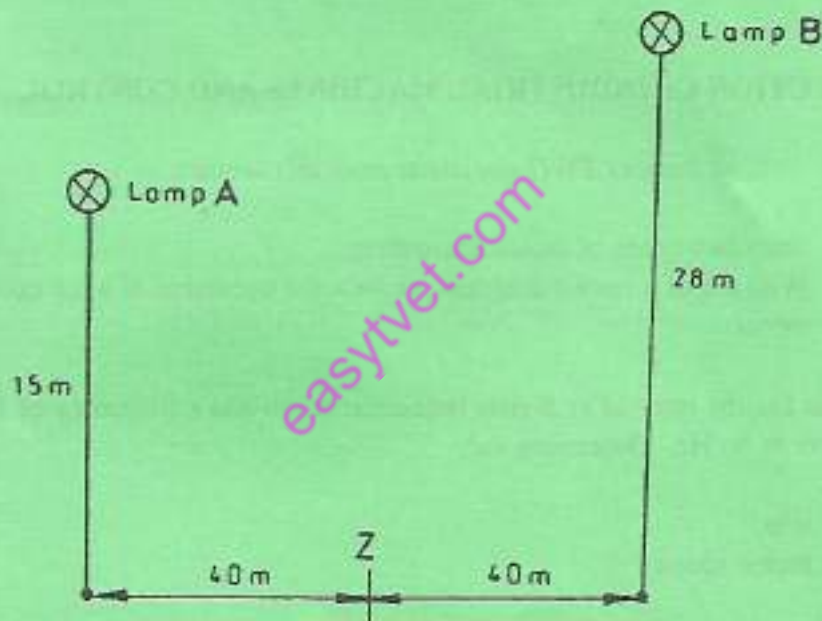


Fig.1

5. (a) Explain each of the following as used in electrical design projects:
- (i) taking off materials from drawing;
 - (ii) take off sheets. (4 marks)
- (b) Differentiate between prime costs and provisional sums in relation to projects. (4 marks)

- (c) (i) List **four** causes of labour turnover.
- (ii) A factory employs 40 casual workers for 30 days. The details of the expenditure are as given:
- Material cost = Ksh 30,000
 Rate of wages of each worker = Ksh 10 per hour
 Duration of work = 8 hours /day
 No. of holidays = 6 days
- Determine the labour cost. (9 marks)
- (d) State **three** types of tenders. (3 marks)

SECTION C: INDUSTRIAL MACHINES AND CONTROL

Answer TWO questions from this section.

6. (a) (i) State **two** types of motor enclosures.
- (ii) With aid of a circuit diagram, explain the operation of a d.c compound wound motor. (7 marks)
- (b) The e.m.f in the rotor of an 8-pole induction motor has a frequency of 1.8 Hz and that in the stator is 50 Hz. Determine the:
- (i) slip;
- (ii) motor speed. (9 marks)
- (c) Draw a labelled circuit diagram of a manual star-delta starter for a three phase induction motor. (4 marks)
7. (a) (i) Explain 'motor speed controller'.
- (ii) List **two** control devices in (i). (4 marks)
- (b) (i) With aid of a circuit diagram, explain rheostatic speed control of a d.c shunt motor.
- (ii) State **three** drawbacks of the speed control method in (b)(i). (8 marks)

- (c) Outline **four** mechanical checks carried out on mounted and wired electrical machines. (4 marks)
- (d) Draw a labelled diagram of a single phase halfwave thyristor speed control of a d.c motor. (4 marks)
8. (a) (i) Explain 'industrial control panel' as used in factory installations.
(ii) Outline **four** features of a good industrial control panel design. (6 marks)
- (b) With aid of a diagram, describe the elements of an instrumentation system. (7 marks)
- (c) Name **four** main parts of a programmable logic controller. (4 marks)
- (d) Using 3 x 5 dot matrix, show how numerals 3 and 4 will be displayed. (3 marks)

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