Name: _____ Index No.: _____

1521/205
1601/205
ELECTRICAL INSTALLATION II,
ESTIMATING AND TENDERING,
INDUSTRIAL MACHINES AND
CONTROLS
Oct./Nov. 2014
Time: 3 hours

Candidate's Signature: _____

Date: _____

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

Write your name and index number in the spaces provided above.
Sign and write the date of examination in the spaces provided above.
You should have a Scientific calculator/Mathematical tables for this examination.
*This paper consists of **TWO** sections; **A** and **B**.*
*Answer any **THREE** questions from section **A**, and any **TWO** questions from section **B** in the spaces provided in this question paper.*
All questions carry equal marks.
Maximum marks for each part of a question are indicated.
*Do **NOT** remove any pages from this booklet.*
Candidates should answer the questions in English.

For Examiner's Use Only

Section	Questions	Maximum Score	Candidate's Score
A		20	
		20	
		20	
B		20	
		20	
	Total Score	100	

This paper consists of 20 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) State the "Inverse Square Law" of illumination;

(ii) Draw a labelled diagram of a tungsten-filament lamp. (6 marks)

(b) (i) With aid of a wiring diagram, explain the operation of a Maintained Emergency Lighting System.

(ii) State any **two** areas where the lighting system in b (i) is used. (7 marks)

(c) An office 18 m by 43 m requires an illumination at desk level of 330 lux. The mounting height of the lamps above the desk level is 2 m. Two alternatives are suggested:

(i) 80 W fluorescent lamps giving 4 800 lumens when new;

(ii) 150 W tungsten filament lamp giving 1 950 lumens when new;

Given a utilization factor of 0.6 and maintenance factor of 0.85, determine the most appropriate and cost effective alternative. (7 marks)

2. (a) Explain a flame-proof equipment in relation to special installations. (3 marks)

(b) State:

(i) Any **three** IEE regulation requirements for metallic conduit wiring system in a flame proof area;

(ii) the recommended cable for use in the area in b (i). (5 marks)

(c) (i) Define the following terms as used in special installation

(I) corrosion;
(II) damp situation;
(III) caravan.

(ii) With aid of a labelled diagram, explain the cathodic impressed current method of corrosion protection. (12 marks)

3. (a) (i) With the aid of a labelled diagram, explain the operation of a hysteresis motor.

(ii) State any **two** unique features and applications of the motor in a (i). (12 marks)

(b) With the aid of a circuit diagram, describe the construction and operation of a capacitor- start capacitor - run single phase induction motor. (8 marks)

4. (a) Outline the precautions to be observed before installing an electric motor. (6 marks)

(b) (i) List any **two** differences between a programmable logic controller and a computer;

(ii) Explain the function of the following in a programmable logic controller:

(I) processor;
(II) programming device (unit). (6 marks)

(c) (i) State any **three** factors that affect the cost of electric motors;

(ii) Outline the procedure of aligning a belt drive of an electric motor. (8 marks)

5. (a) (i) Explain the purpose of a "Bill of Quantities" in estimating and tendering;

(ii) Distinguish between an "estimate" and a "tender". (7 marks)

(b) (i) Define a 'Tender Document';

(ii) State any **four** parts of the document in b (i). (7 marks)

(c) Explain the need for the following when used in the pricing of preliminary items:

(i) provision of a guarantee bond;

(ii) provision of temporary accommodation;

(iii) safety, health and welfare of people. (6 marks)

SECTION B

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

6. (a) A continuous ringing bell is to be operated from six positions through a six-way indicator board. The supply is to be taken from a 240 V a.c. supply via a class A bell transformer. Draw a circuit diagram, of the whole installation showing the necessary control equipment. (8 marks)

(b) (i) State **one** IEE Regulation requirement regarding wiring systems;

(ii) Distinguish between vertical rising mains and overhead busbar system of wiring. (6 marks)

(c) (i) Draw a labelled diagram of a catenary supported wiring system.

(ii) Define a "House Service Overhead System". (6 marks)

7. (a) Define the following as used in electrical installations:

(i) consumers terminal;

(ii) switch gear. (4 marks)

(b) Explain the circumstance under which each of the following detectors may give a false alarm:

(i) heat detectors;

(ii) smoke detectors. (4 marks)

(c) (i) An industrial consumer has annual electricity consumption of 10^6 kWh and a maximum demand of 1 000 kVA. If the maximum demand charge is Ksh 30 per kVA and Ksh 0.04 per kWh, determine his overall charge on electricity per unit.

(ii) Draw a typical distribution of electric power to a commercial or industrial building to supply three phase loads A, B, C and final circuits through a three phase distribution board. (12 marks)

8. (a) State **four** elements of an instrumentation system. (4 marks)

(b) Draw a typical block diagram showing the relationship between analogue and digital signals in an instrumentation system. (7 marks)

(c) With the aid of a labelled block diagram, describe the construction and operation of a cathode ray tube (oscillographic) recorder. (9 marks)