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1601/205

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

June/July 2017

Time: 3 hours

15 AUG 2017



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 the following for this examination:*

*Answer booklet;*

*Mathematical tables/scientific calculator;*

*This paper consists of EIGHT questions in THREE sections: A, B and C.*

*Answer any TWO questions from section A, TWO questions from section B and ONE question from section C.*

*All questions carry equal marks.*

*Maximum marks for each part of a question are as indicated.*

*Candidates should answer the questions in English.*

**This question paper consists of 4 printed pages.**

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

## SECTION A: ELECTRICAL INSTALLATION II

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

1. (a) State two:
- (i) advantages of steel conduit wiring system;
  - (ii) IEE regulation requirements regarding steel conduit wiring system. (4 marks)
- (b) Describe the vertical busbar trunking rising mains wiring system. (4 marks)
- (c) Explain the following terms in relation to electrical energy consumption:
- (i) load factor;
  - (ii) demand factor. (4 marks)
- (d) (i) Explain the 'flat rate' type of tariff. (2 marks)
- (ii) A factory has the following daily load consumption:
- 300 kW for 2 hours per day.  
100 kW for 8 hours per day.  
50 kW for 4 hours per day.
- The charge for energy is made on the basis of Ksh. 10 per kW of maximum demand plus 0.75 cents per unit, for 5 days per week and 50 weeks per year. Determine the cost per year of energy consumed by the factory. (6 marks)
2. (a) Describe a 'fire alarm system'. (4 marks)
- (b) State **four** IEE regulation requirements for bell transformer. (4 marks)
- (c) (i) Explain the differences between a 'receiver' and a 'transmitter' in a bell circuit.
- (ii) With the aid of a labelled diagram, explain the operation of a telephone transmitter. (9 marks)
- (d) Draw a labelled circuit diagram of a simple telephone circuit. (3 marks)
3. (a) Define the following terms with respect to hazardous areas:
- (i) division 0;
  - (ii) division 1. (4 marks)
- (b) Draw a diagram to show how an electrical machine can be installed in division 0 area. (4 marks)

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- (c) Outline **three** IEE regulation requirements for installing steel conduits in the following environments:
- (i) damp situation;
  - (ii) flammable and explosive areas. (6 marks)
- (d) Explain:
- (i) the generation of static electricity in hospitals and industries;
  - (ii) how to overcome static charges. (6 marks)

### SECTION B: INDUSTRIAL MACHINES AND CONTROLS

*Answer any TWO questions from this section.*

4. (a) (i) Explain the reason why a single phase induction motor is not self starting.
- (ii) With aid of a labelled circuit diagram, explain the operation of a capacitor start single phase induction motor. (10 marks)
- (b) Explain how cooling is achieved in the following motor enclosures:
- (i) pipe ventilated type;
  - (ii) screen protected type. (4 marks)
- (c) Outline **three**:
- (i) IEE regulation requirements regarding electric motors;
  - (ii) factors to be considered when selecting a motor for a particular drive. (6 marks)
5. (a) Explain the functions of the following elements of an instrumentation system:
- (i) transducer;
  - (ii) signal conditioner. (4 marks)
- (b) With the aid of a labelled block diagram, explain the functions of the elements of a Programmable Logic Controller (PLC) system. (10 marks)
- (c) Draw a PLC ladder diagram for the control of a forward reverse starter of a three - phase induction motor. (6 marks)
6. (a) State:
- (i) **two** features of a homopolar motor;
  - (ii) **three** qualities of a d.c motor starter. (5 marks)

- (b) Outline the procedure of mounting a motor on a slide rail assembly on a concrete floor. (5 marks)
- (c) Draw a circuit diagram of a forward reverse starter for a three phase induction motor. (10 marks)

### SECTION C: ESTIMATING AND TENDERING

*Answer any ONE question from this section.*

7. (a) Define the term 'tender' as used in the construction industry. (3 marks)
- (b) Describe the following types of tendering:
- (i) open tendering;
- (ii) selective tendering. (6 marks)
- (c) Explain the following as used in the process of 'taking off' materials from drawings during preparation of an estimate:
- (i) numbered items;
- (ii) measured items. (4 marks)
- (d) (i) Distinguish between provisional sum and prime cost in relation to costing a project.
- (ii) Outline **three** conditions in which a contract may be discharged. (7 marks)
8. (a) Define the following terms as used in illumination:
- (i) utilization factor;
- (ii) glare. (2 marks)
- (b) An incandescent lamp hanging on a ceiling of a house gives equal illuminance in a room. The illuminance received on a bench lying vertically below the lamp is 63 lux and 2 metres away is 31 lux. Determine the:
- (i) vertical distance of the lamp above the bench;
- (ii) luminous intensity of the lamp. (8 marks)
- (c) Outline the procedure of designing the number of luminaires in a given room. (10 marks)

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