THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

081

ELECTRICAL INSTALLATION
(For Both School and Private Candidates)

Time: 3 Hours **Friday, 14th November 2014 p.m.**

Instructions

1. This paper consists of sections A, B and C.
2. Answer **all** questions in sections A and B and **three (3)** questions from section C.
3. Non programmable calculators may be used.
4. Cellular phones are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).

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SECTION A (10 Marks)

Answer **all** questions in this section.

1. For each of items (i) – (x), choose the correct answer from among the given alternatives and write its letter beside the item number in your answer booklet.

(i) The suitable type of switches for controlling one light or a group of lights from three different positions are
A two 2 – way – 2 – gang switches and an intermediate switch
B 2 – way – 3 – gang switch
C two 2 – way – 1 – gang switches and an intermediate switch
D 1– way – 3 – gang switch
E 1 – way – 1 – gang switch and two 2 – way – 1 gang switches

(ii) Fuse failure due to bad contact is the result of
A excessive voltage in the circuit
B heating effect
C increased current in the circuit
D wrong size of a fuse wire
E lowered resistance due to bad contact.

(iii) What type of the capacitor is used on a capacitor start motor?
A Electrolyte capacitor
B Large foil paper capacitor.
C Ceramic capacitor
D Disc capacitor.
E Power factor correction capacitor.

(iv) Which of the following has the greatest electrical resistance?
A A thick copper wire 2 m long.
B A thick copper wire 5 m long
C A thin copper wire 2 m long.
D A thin copper wire 5 m long.
E A thick copper wire 1 m long .

(v) For a cable to cross a road, it should
A run as overhead cable
B be buried in trenches
C be hardened and tempered
D be laid in pipes or conduits
E be surrounded by bust to absorb vibrations

(vi) A device which changes its electrical resistance when illuminated by light is called
A photo voltaic
B photo electric
C photo conductive
D photo diode
E photo transistor.

(vii) The tool used to remove sharp edges of a metal conduit is known as
A reamer
B chisel
C pin punch
D wire stripper
E gas pliers.

(viii) A good instrument suitable for testing verification of polarity is known as
A voltmeter
B tong tester meter
C ohmmeter
D ammeter
E photometer.

(ix) The source of electric power which is mostly used in Tanzania is
A water B gas C solar D wind E coal.

(x) The element which is mostly used to control heat in electric irons is
A magnet B resistor C metal strips
D fuse E circuit breaker.

SECTION B (30 Marks)

Answer **all** questions in this section.

2. Define the following terms as used in electrical installation field:
(a) Consumer's earthing terminal.
(b) Artificial respiration.
(c) Switch gears.

3. (a) Why is it necessary to test verification of polarity?
(b) What is the purpose of
(i) earthing fault loop impedance test?
(ii) testing between poles?

4. Briefly, explain three factors in which severity of electric shock depend on.

5. Outline essential required properties in which conductor and insulator should possess. Give three requirements for each case.

6. (a) (i) Give the meaning of the term tariff as used in power supply.
(ii) What is the main objective of tariff?
(b) Mention two types of cost of producing electric power incurred by the supply company.

7. Write the function of the following accessories
(i) Two way switch
(ii) Ceiling rose
(iii) Switch socket

8. A single phase step-down transformer having a ratio of 10:1 has primary voltage of 6.6 kV. Since losses are negligible, calculate the secondary current when it is loaded at 13200 VA.

9. A four pole d.c generator has a wave wound armature having 50 slots with 14 conductors per slot and is driven at 1000 rpm. If the useful flux per pole is 24 mWb, calculate the value of electromotive force produced.

10. Explain three differences between magnetic and electric circuits.

11. (a) Where do the following wiring systems are recommended to be used?
(i) Ducting (ii) Trunking
(b) What type of conduit must be used for flame proof installations?

SECTION C (60 Marks)

Answer **three (3)** questions from this section.

12. (a) (i) Electric heating is far superior and mostly preferred compared to other methods of heating. Discuss six factors which support the statement.
(ii) What are the domestic and industrial applications of electric heating? In each case mention four applications. **(10 marks)**

(b) A three heat circuit system consists of plate containing two elements A and B controlled by heat switch. Element A has a resistance of 500 Ω and element B has a resistance of 600 Ω.
(i) Draw the circuit to show the arrangement of the elements and switch at high and low position.
(ii) Calculate the value of the circuit resistance when the switch is at low and high positions.
(iii) What is the power consumption of the element in high position if the elements are connected across a 240 V supply? **(10 marks)**

13. (a) Draw a diagram of a 3-phase, 4-wire supply system which shows the service connections at a consumer's premises. In your diagram show the phase and line voltages. **(05 marks)**

(b) Explain five factors to be considered when selecting the type of wiring system. **(05 marks)**

(c) Find the total saving in electrical load and percentage increase in illumination; if instead of using twelve 150 W tungsten filament lamps we use twelve 80 W fluorescent tubes it may be assumed that:
(i) there is a choke loss of 25 per cent of rated fluorescent tubes wattage.
(ii) average luminous efficiency throughout life for each lamp is 15 /m/W and for each tube is 40 /m/W
(iii) coefficient of utilization remains the same in both cases. **(10 marks)**

14. (a) Give four advantages and four disadvantages of a moving iron instruments. **(04 marks)**

(b) With the aid of diagram, explain how the power in a 3-phase balanced circuit can be measured. **(05 marks)**

(c) The steady readings obtained from two single phase watt meters used to measure the power supply to a three phase load are 14 W and 35 kW. Calculate the
(i) power factor
(ii) line current, if the supply is 415 V, three phase. **(11 marks)**

15. (a) State the function of the following devices in fluorescent lamp **(03 marks)**
(i) Choke
(ii) Capacitor
(iii) Starter switch

(b) (i) What is the meaning of stroboscopic effect of fluorescent lamp?
(ii) Why is stroboscopic effect dangerous in some instances?
(iii) Suggest three methods which could be employed to minimize the stroboscopic effect.
(iv) Show by means of circuit diagram how twelve fluorescent lamps can be arranged on 3-phase supply system to minimize the effect in b (iii) above. **(09 marks)**

(c) A workshop measures 15 m x 25 m and is lighted by 30 lamps of 200 watts each having an efficiency of 15 lumens per watt. Assuming utilization factor of 0.5 and depreciation factor of 0.8. Find the illumination on the working plane. **(08 marks)**

16. (a) (i) Write down two types of protection which should be provided in the face plate starter.
(ii) Describe how the speed of d.c shunt motor is controlled.
(iii) What are the factors in which the speed of a d.c motor depends on?
(iv) Briefly, explain three types of loss in a d.c machine. **(10 marks)**

(b) A 7.5 KW, 220 V shunt motor has a full load speed of 1000 r.p.m. The resistance of the armature and field circuits is 0.25 Ω and 146 Ω respectively. The full load efficiency of the motor is 85.2%. Neglecting brush drop and the effect of armature reaction, calculate back e.m.f generated on full load. **(10 marks)**