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, 15th November 2013 p.m.**

Instructions

1. This paper consists of sections A, B and C.
2. Answer **all** the 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).

SECTION A (10 Marks)

Answer **all** questions in this section.

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

(i) The function of gang in a switch is to
A provide good current
B close and open the circuit
C neutralize the effect of transient
D interrupt any value of current
E limit the flow of flux.

(ii) Voltmeter must have very high internal resistance so that
A accuracy of the meter is high
B range of the meter is high
C loading effect is minimum
D sensitivity of the meter is high
E minimum current passes through the meter.

(iii) Which of the following tests are commonly used in electrical installation?
A Earth resistance, polarity and energy
B Polarity, conductivity and resistivity
C Energy, continuity and conductivity
D Conductivity, polarity and earth resistance
E Conductivity, earth resistance and energy.

(iv) The capacity of generator energy depends on the
A capacity of generators installed
B kWh generation in a month
C resistance of the given conductor
D limitation of power in kVA
E power output of the engine

(v) The voltage rating of a cable depends on the
A diameter of the conductor
B thickness of the insulation
C strength of insulation
D resistance of the conductor
E cross-sectional area of the conductor.

(vi) The purpose of a grid system is to
A supply energy to remote areas
B make distribution of energy at reasonable cost
C inter-connect the power stations
D make high voltage available to consumers
E reduce the running cost of conductor.

(vii) For an adequate hand-hold, a ladder should extend above the stepping off point by a minimum of
A 1.00 m B 2.50 m C 3.00 m D 4.15 m E 5.00 m

(viii) If a battery acid is accidentally spilled on the skin, the affected part should immediately be
A washed with methylated spirit
B flooded with cold water
C seen by a doctor
D covered with a sterile dressing
E covered with antiseptic cream

(ix) Which of the following is a suitable wiring system for high-roofed building?

A Catenary B Cleat C House-service overhead
D Casing capping E Metal sheathed.

(x) The factor that determines the current rating of the fuse or circuit breaker that should be installed in a lighting circuit is the

A wattage of the individual lamps B capacity of the largest wire in the circuit
C voltage drop of the circuit D capacity of the smallest wire in the circuit
E total resistance of the circuit.

SECTION B (30 Marks)

Answer **all** questions in this section

2. Mention six measures which must be taken into consideration to ensure safety before doing any electrical maintenance job.

3. (a) Why copper is largely used to manufacture cables in preference to other metals? Give two reasons.
(b) What type of insulator material is used as transformer bushing on the high tension side?

4. (a) State two areas in the building where normal heat loss can take place.
(b) Calculate the quantity of heat required to raise the temperature of 20 kg of water from 30^0C to 100^0C. Take the specific heat capacity of water as 4.2 kJ per Kg^0C.

5. (a) What is the difference between inspection and testing of an installation?
(b) What should be checked while doing an inspection of a completed electrical installation?

6. (a) State three important characteristics of materials used for fuse wire.
(b) Mention three factors which should be considered when determining the size of the fuse wire required for an installation.

7. (a) (i) What is tariff?
(ii) Give the main objective of tariff?
(b) Mention two types of cost of producing electric power incurred by the supply company.

8. (a) What is an 'electric shock'?
(b) What are the four necessary steps to be taken in case of an electric fire?

9. (a) Give two factors which synchronous speed of the stator field of an a.c motor depends on.
(b) The speed of an a.c motor is 1500 rpm when supplied at 240 V. Find the frequency of the motor if it has eight poles.

10. (a) State two differences between a stranded conductor and a bunched conductor.
(b) Why are indicator boards necessary in bell circuits?

11. (a) Where can the trunking wiring systems be used in electrical works?
(b) Mention four methods of installing a wiring system.

SECTION C (60 Marks)

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

12. (a) Give the difference between coefficient of utilization and maintenance factor. **(02 marks)**

(b) (i) Draw a circuit diagram showing the working principle of fluorescent lamp.
(ii) Explain the use of a starter in a fluorescent lamp.
(iii) Why fluorescent lamp is most popular compared to incandescent lamp? Give two reasons. **(08 marks)**

(c) An incandescent filament lamp suspended 2.5 m above a work bench is fitted with a reflector to give a polar curve which has the shape of a circle with the circumference passing through the center of the light source and giving an intensity of 500 cd vertically below the lamp.
(i) Calculate the illumination on the bench.
(ii) With the help of a diagram, find the position along the bench where the illumination will be half the value found in (c) (i) above. **(10 marks)**

13. (a) Explain the principles used in the operation of the following measuring instruments:
(i) Moving iron instruments.
(ii) Moving coil instruments. **(04 marks)**

(b) With the aid of diagram, explain how the range of an ammeter and voltmeter can be extended. **(04 marks)**

(c) A moving coil instrument has a resistance of 5 Ω and gives a full scale reading of 50 mA. Calculate value of
(i) shunt resistance required to increase the range of an ammeter up to 200 A and find the amount of consumed power.
(ii) series resistance required to use it as a voltmeter of range 0 - 750 V and find the amount of consumed power. **(12 marks)**

14. (a) (i) Mention four categories of d.c generator and describe the application of each category.
(ii) When the load resistance is connected across the terminals of the d.c generator, the terminal voltage becomes slightly less than the generated voltage. Explain three reasons which make this to happen. **(12 marks)**

(b) (i) What is a separately excited generator?
(ii) A separately excited generator running at 1000 r.p.m. supplies a current of 1000 amperes on bus bar of 500 volts. Determine its speed when it is delivering a current of 500 amperes on the same bus bar if excitation remains constant. The armature resistance is 0.02 Ω. **(08 marks)**

15. (a) (i) What is meant by service line.
(ii) Distinguish between transmission and distribution systems.
(iii) Briefly explain four advantages of inter connection of electrical power stations to a national grid system
(06 marks)

(b) Explain five factors to consider when selecting the location of hydroelectric power station.
(05 marks)

(c) A power station supplied the peak loads of 40 MW, 25 MW and 30 MW to three localities. The annual load factor is 0.80 and the diversity factor of the load at the station is 1.80. Calculate
(i) the maximum demand on the station
(ii) installed capacity
(iii) energy supplied in a year.
(09 marks)

16. (a) (i) Briefly explain four conditions for a transformer to act as an ideal transformer.
(ii) Give three applications of an auto transformer.
(07 marks)

(b) (i) A single phase transformer is rated at 100 kVA, 2300/230 V, 50 Hz. The maximum flux density in the core is 1.2 Wb/m^2 and the net cross sectional area of the core is 0.04 m^2. Determine the number of primary and secondary turns needed.

(ii) The mean length of the magnetic circuit is 2.5 m and the relative permeability is 1200. Determine the magnetizing current and energy stored if its inductance is 3 H_e. Neglect the current drawn for the core loss. Take permeability of free space. $\mu_o = 4\pi \times 10^{-7}$
(13 marks)