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, 11th November 2016 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. Cellular phones are **not** allowed in the examination room.
4. Non programmable calculators may be used.
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 correct answer from among the given alternatives and write its letter beside the item number in the answer booklet provided.

(i) What is the recommended current rating of the main switch found in a domestic consumer control unit?
A 60 A. B 30 A. C 20 A. D 40 A. E 80 A.

(ii) What is the supply voltage recommended for three phase induction motors in Tanzania?
A 415 V B 400 V C 250 V D 240 V E 460 V

(iii) What is luminaire?
A It is a source of light. B It is anything that emits solar energy.
C It is a lighting fitting. D It is the unit of light intensity.
E It is a lamp with less than 50 candelas.

(iv) The best power supply suitable for both lighting circuits and industrial loads is
A single phase supply system B three phase supply system
C two phase supply system D delta connected three phase system
E star connected three phase system

(v) Which one of the following is the main disadvantage of the plastic conduit wiring system?
A It is liable to corrosion.
B It provides earth return path.
C It is more expensive compared to metallic conduit wiring system.
D It requires a separate earth wire inside the conduit.
E It needs extra mechanical support.

(vi) Why a reasonable tariff to each type of consumer should include fixed and unit charges?
A To cover running costs and interest on capital cost per unit.
B To cover depreciation costs and standing cost per unit.
C To cover standing costs and running costs per unit.
D To cover taxes and running costs per unit.
E To cover standing costs and interest on capital cost per unit.

(vii) The first safety precaution to be taken in an electrical workshop is
A to switch 'on' all lighting points in workshop.
B to operate the workshop fire extinguisher.
C to clean the workshop.
D to switch 'off' all lighting points in workshop.
E to undertake the class installation works given by an instructor.

(viii) What type of wiring system is recommended for a petrol filling station?
A PVC sheathed cable.
B PVC insulated and sheathed armoured cable.
C Paper insulated and impregnated cable.
D M.I.C.S with overall PVC sheath cable
E Rubber insulated cable.

(ix) Why copper conductors are tinned?
A To make the conductors appear white.
B To improve the flexibility of the cables.
C To prevent copper from reacting with sulpher from the rubber insulation.
D To change the appearance when the conductor is joined with aluminium conductor.
E To meet IEE regulations concerning flexible cables.

(x) Which one of the following is **not** true about power transformers?
A They are used to step up or down the power of a transmission line.
B Their cores are made of silicon steel laminations.
C They need constant cooling when they are in operation.
D They are more efficient than the other ac machines.
E They are made in different sizes depending on voltage and power levels.

SECTION B (30 Marks)

Answer **all** questions in this section.

2. (a) Define the temperature coefficient of resistance of a material.
(b) Briefly explain the effect of heat on;
(i) the resistance of pure conductor.
(ii) the resistance of semiconductor.

3. Compute the rotor speed (in r.p.m) for a 4-pole turbo alternator if the frequency of the induced e.m.f is 50 Hz.

4. (a) Briefly describe the following types of d.c generators.
(i) Separately-excited generators.
(ii) Self-excited generators.

(b) Name two types of self-excited generators.

5. Briefly explain the function of the following tools which are used by an electrician in performing electrical installation works:
(a) Pliers
(b) Mallet
(c) Spirit level.

6. (a) Mention two types of fuses.

(b) Explain the operational difference between a fuse and a circuit breaker.

7. Briefly explain three types of indicator elements used in electric signaling systems.

8. With the aid of a diagram, explain how the range of an ammeter can be extended.

9. (a) Mention one type of lamp which can be used for both d.c and a.c circuit.
   (b) Explain the function of the following parts of a fluorescent lamp:
      (i) Choke
      (ii) Capacitor.

10. Draw a diagram showing how the TANESCO power supply is connected to a domestic consumer premises and the unit which records the consumed electrical energy.

11. Explain three advantages of 3-phase induction motors over the single phase induction motors.

SECTION C (60 Marks)

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

12. A lighting circuit is to be designed using two 2-way switches S_1 and S_2 and two bulbs L_1 & L_2. The circuit should operate as follows:
    S1 down, S2 up – light off
    S1 up, S2 down – L1 ON (medium light)
    S1 up, S2 up – L1 and L2 in parallel (bright light)
    S1 down, S2 down – L1 and L2 in series (dim light)

    (a) Draw a schematic diagram for the circuit. **(10 marks)**
    (b) Draw a wiring diagram for the circuit. **(10 marks)**

13. (a) Explain the use of the following as used in domestic wiring system: **(04 marks)**
      (i) Ducting
      (ii) Trunking
      (iii) Conduit
      (iv) Catenary wire

    (b) Give six advantages which differentiate lead-sheathed wiring system from conduit wiring system. **(06 marks)**

    (c) (i) Briefly explain how a running coupler is used to join two pieces of steel conduits.
      (ii) Briefly explain seven points which should be kept in mind for installation of metal-sheathed wiring. **(10 marks)**

14. (a) Briefly explain two methods used to reduce power loss of a transformer. **(04 marks)**

(b) Compare an auto-transformer to double wound transformer. **(04 marks)**

(c) Show how the windings of a transformer can be connected in **(06 marks)**
(i) star connection
(ii) delta connection.

(d) A 50 kVA single phase transformer has a primary voltage of 6600 V and a secondary voltage of 250 V. It has 52 secondary turns. Neglecting losses, find;
(i) The number of primary turns.
(ii) The primary currents.
(iii) The secondary currents. **(06 marks)**

15 (a) With the help of a simple labeled circuit diagram, show how you can test the insulation resistance of a load resistor (R_L) using an appropriate measuring instrument. **(07 marks)**

(b) Explain four tests which should be done to a new installation before connecting it to the power supply. **(08 marks)**

(c) (i) Differentiate "inspection" from "testing" of an electrical installation.
(i) The most vulnerable part of any electrical system is a cable. Give three basic steps to be followed in locating a fault in a cable **(05 marks)**

16. (a) Briefly explain standing costs and running costs of electricity. Give four examples in each case. **(06 marks)**

(b) Briefly explain the following tariffs: **(04 marks)**
(i) flat rate tariffs
(ii) two part tariffs.

(c) A factory is loaded daily as follows: 250 kVA for 2 hours, 180 kVA for 8 hours and 75 kVA for 6 hours per day. The charge for the energy is made on a basis of TZS 10,000 per kVA of maximum demand plus TZS 500 per unit. Assuming a 5-day week, 50 week year and a unit power factor; calculate the cost per year of the energy supplied. **(10 marks)**