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

081 **ELECTRICAL INSTALLATION**
(For Both School and Private Candidates)

Time: 3 Hours **Tuesday, 13th November 2018 p.m.**

Instructions

1. This paper consists of sections A, B and C with a total of **sixteen (16)** questions.
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 and any unauthorized materials 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 the items (i) – (x), choose the correct answer from among the given alternatives and write its letter besides the item number in the answer booklet provided.

(i) The following items are electronic accessories **except**

A luminaire. B lamp holder. C ceiling rose.
D fuse. E socket-outlet.

(ii) Core laminations are generally made up of

A cast iron. B Carbon. C silicon steel.
D stainless steel. E mica.

(iii) Why is it necessary to apply safety rules in a working place?

A To avoid burning B To prevent accidents
C To put on workshop gear D To take safety measure early
E To wear supportive garment

(iv) What is the value of the synchronous speed of a 4-pole 3-phase induction motor running from a 50 Hz power supply?

A 3600 rev/m B 3000 rev/m C 1800 rev/m D 1500 rev/m E 750 rev/m

(v) Which of the following are considered as running costs of a power station?

A Fuel and generators B Fuel and water C Water and motors
D Generator and motors E Taxes and insurance

(vi) The practical application of low pressure mercury vapour is in

A road lighting. B flood lighting.
C lighting of homes. D lighting industrial premises.
E street lighting.

(vii) The extension of voltmeter range can be achieved when

A a load is disconnected from the circuit.
B a resistor is connected in parallel to the voltmeter.
C an ammeter is connected parallel to the voltmeter.
D a multiplier resistor is connected in series to the voltmeter.
E two voltmeters are used in series.

(viii) The electric system whereby the supply voltage is 240 V a.c. is known as

A live and neutral supply system.
B domestic supply system.
C single phase two wire.
D single phase three wire.
E two conductors supply system.

(ix) Which of the following devices is necessarily required for automatic temperature control in a furnace?

A Thermocouple
B Thermostat
C Auto transformer
D Heating element
E voltage regulator

(x) The purpose of inspecting an installation is

A to identify small faults and rectify them before final test
B to identify leakage currents before connecting the circuit to power
C to know the number of accessories already installed
D to have communication between the contractor and the engineer
E to find time to assess the work

SECTION B (30 Marks)

Answer **all** questions in this section.

2. (a) What does the term *power distribution* imply as far as electric power generation is concerned?
   (b) Differentiate between *a feeder* and *a distributor* as applied in transmission lines.

3. Give three necessity of fitting protective switchgear to consumer's installation.

4. (a) What is insulation?
   (b) A certain cable has an insulation resistance of 150 MΩ per meter length. Calculate the insulation value of 50 meter length of this cable.

5. Draw a wiring diagram of a lamp controlled by two 2 - way switches.

6. (a) Define the term 'resistance'.
   (b) (i) Why electrical devices are connected in parallel in a consumer's installation?
   (ii) What will happen to the devices if they are connected in series?

7. (a) Give the meaning of the term 'appliance' as used in electrical engineering.
   (b) Differentiate lamp holder from ceiling roses basing on their uses.

8. (a) What electrical quantities identify the rate of electric lamps?
   (b) Differentiate filament lamps from discharge lamps.

9. State three differences between heat and temperature.

10. Give three procedures to be followed while carrying out the insulation - resistance test of conductors to earth.

11. (a) Which feature distinguish *step down* from *step up* transformer?
(b) If no-load secondary voltage of a transformer is 500V and its secondary terminal voltage under full load condition is 460V, find the percentage voltage regulation. 15.

SECTION C (60 Marks)

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

12. (a) What are the four applications of synchronous motors? **(04 marks)**
(b) Why the following motors are used in the particular applications indicated against them?
(i) D.C. shunt motors are used in lathes. 16.
(ii) D.C. series motors are used in lifts and cranes.
(iii) Cumulative compound motor are used for rolling mills.
(iv) Three phase induction motors are useful in industrial applications. **(04 marks)**
(c) A 440 V shunt motor has armature resistance of 0.8 Ω and field resistance of 200 Ω. Determine the back e.m.f when giving an output of 7.46 kW at 85 per cent efficiency. **(12 marks)**

13. (a) A D.C motor fails to start when switched on. Briefly explain three possible causes for such failure and how each cause can be remedied. **(03 marks)**
(b) A 240 V shunt motor having field and armature resistance of 50 Ω and 0.1 Ω respectively takes a total current of 80A and runs at 800 rpm. Find the:
(i) Back e.m.f.
(ii) Copper losses.
(iii) Armature torque.
(iv) Output power. **(17 marks)**

14. (a) (i) State the inverse square law of illumination.
(ii) What are the five characteristics of a tungsten filament that make it mostly used in almost all modern incandescent lamps? **(07 marks)**
(b) A workshop of 20 m by 25 m requires an illumination of 480lux at the working bench level. If the mounting height of the lamps is 2m above the bench level, the following alternatives are suggested:
(i) 120 W fluorescent lamp giving 2200 lumens
(ii) 240 W tungsten filament lamp giving 1000 lumens
Calculate the number of lamps needed for each alternative, assuming that the coefficient of utilization is 0.6 and the maintenance factor is 0.8. **(07 marks)**

(c) An incandescent lamp with a luminous intensity of 60cd in all direction provides an illumination of 26.7 lux at the surface of a table directly below the lamp.

(i) How far is the lamp above the table?

(ii) What illumination would be provided at the table by changing the lamp to 100cd and reducing the height by 6.7cm? **(06 marks)**

15. (a) (i) Mention three types of D.C generators and give the application of each type.

(ii) Give three facts which differentiate lap winding from wave winding. **(12 marks)**

(b) A D.C shunt generator supplies a current of 28A at 400 V. If the armature and field resistances are 0.5 Ω and 200 Ω respectively;

(i) Draw and label a circuit diagram of the machine indicating the field current, the armature current and the generated e.m.f.

(ii) Calculate the armature current and the generated e.m.f. **(08 marks)**

16. (a) (i) What are the two differences between analogy instruments and digital instruments?

(ii) Give four advantages of electronic instruments over electrical instruments basing on measurements. **(08 marks)**

(b) Mention three advantages and three disadvantages of a moving iron instruments. **(06 marks)**

(c) A moving coil instrument gives a full-scale deflection with a current of 60 mA and a voltage of 180 mV. With the help of a labeled sketch, calculate the value of a resistor to be connected in series with the instrument, so that it can be used to read up to 100 V. **(06 marks)**