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, 23rd October 2009 a.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. Electronic calculators are **not** allowed in the examination room.
4. Cellular phones are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).

This paper consists of 5 printed pages.

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.

(i) Which power plant has got the least cost of operation?
- A Gas turbine plant
- B Thermal power plant
- C Nuclear power plant
- D Hydroelectric plant
- E Diesel engine power plant.

(ii) A consumer finds that after running 10 kVA equipment on full load for six hours, his energy consumption was 48 kW. What conclusion can be drawn?
- A The load factor of the consumer for the day was unity
- B The maximum demand of the consumer was 10 kW
- C The average load is the same as peak load
- D The equipment was drawing reactive power only
- E Power factor of the equipment was 0.8.

(iii) Which of the following should be used for extinguishing electrical fires?
- A Water
- B Carbon dioxide fire extinguisher
- C Foam factor type fire extinguisher
- D Carbon tetrachloride fire extinguisher
- E Sand

(iv) Aluminium is mainly favoured as bus-bar material because
- A it is easy to fabricate
- B of low density
- C it has got low cost
- D of non availability of copper
- E it has got high tensile strength.

(v) In a circuit breaker the current which exists at the instant of contact separation is known as
- A breaking current
- B restriking current
- C surge current
- D recovery current
- E extinction current.

(vi) Why does breakdown occur in cables?

A Constant loss of insulation due to evaporation result into breakage.

B Heating of cables when on load and cooling when not on load results in formation of voids which ultimately result in breakdown.

C Due to capacitive and inductive effects, some of the materials used for insulation losses its properties resulting into over-stressing.

D Due to heating of cables, insulation and conductor become one material and electrostatic charge appears on the surface of the cable, causing sparking.

E Materials used for cables are organic which lead to high water absorption ultimately results into breakdown.

(vii) When a fluorescent lamp is to be operated on dc, which of the following additional device must be incorporated in the circuit?

A Condenser

B Transformer

C Resistance

D Inductance

E Alternator.

(viii) A Meggar is a device used for measuring very high

A resistance

B current

C voltage

D power

E frequency.

(ix) Which of the following loss in a transformer is zero even at full load?

A Eddy current loss

B Hysteresis loss

C Core loss

D Friction loss

E Mechanical loss.

(x) For which application a d.c motor is preferred over an a.c motor?

A Low speed operation

B High speed operation

C Variable speed operation

D Fixed speed operation

E Infinite speed operation.

SECTION B (30 Marks)

Answer **all** questions in this section.

2. Describe the following terms:
   (i) Fuse
   (ii) Fuse element
   (iii) Minimum fusing current

3. Mention three (3) precautions one should take when wiring a bathroom.

4. Name three (3) ways in which fire risks can arise in an electrical installation.

5. A sub circuit is to supply a 3 kW heater. It is decided to use single-core PVC insulated cables. The supply is 240 V and the ambient temperature is 30^0 C. Determine the:
   (a) Design current of the circuit.
   (b) Ratings of the miniature circuit breaker to protect this circuit.

6. Name three (3) advantages of high voltage distribution.

7. List three (3) basic tools and their function needed by an electrician for general installation work.

8. (a) Why is earthing necessary in electrical equipment?
   (b) Mention four (4) precautions which should be taken against electric shock.

9. Why do we get the bright light when lamps are connected in parallel? Give two (2) reasons.

10. A d.c series generator delivers a current of 120 A at 300 V. If the armature and series field resistance are 0.1 Ω and 0.05 Ω respectively, find the armature current and generated e.m.f.

11. Give two (2) types of earth leakage circuit breaker. Which one is recommended for installation in a dry area?

SECTION C (60 Marks)

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

12. (a) Why is transformer rating in kVA?

(b) The efficiency of a 1000 kVA, 110/220 V, 50 Hz single phase transformer is 98.5% at half full-load at 0.8 p.f leading and 98.8% at full load at unity power factor. Determine iron loss and full load copper loss.

13. (a) What is a tariff?

(b) A power consumer which has a constant maximum demand throughout the year is offered the following tariff: Five hundred Tanzania shillings per kW of maximum demand per annum plus twenty-five shillings per unit. The annual maximum demand is 250 kW and his annual consumption is 350,000 units (kWh). Calculate the

(i) Annual cost of maximum demand only.

(ii) Overall cost of the year.

(iii) Average price per unit.

14. (a) Explain the difference between a wound rotor of a three phase induction motor and a squirrel cage induction rotor.

(b) A 24 kW, 415 V three phase induction motor working at full load on a 0.8 power factor has an efficiency of 89 percent. This motor is supplied from a motor generator set consisting of a 460 V d.c motor. The respective efficiencies of the motor and the alternator are 85 percent and 90 percent. Calculate the:

(i) Line current of the induction motor.

(ii) Current taken by the d.c motor.

15. Draw a wiring diagram, single line diagram and schematic diagram of two electric bells controlled by their respective push buttons located at two different places, such that the bell should ring when its respective push button is pressed. Looping system of wiring should be adopted.

16. (a) Distinguish clearly between absolute instruments and secondary instruments.

(b) A single phase energy meter has a constant of 1500 rev/kWh. If 8 lamps of 100 W, 6 fans of 60 W and 2 heaters of 1000 W operate for one hour the disc makes 4500 revolutions. Find out, whether the meter reads correctly. If not, find the percentage error.