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

081

ELECTRICAL INSTALLATION

TIME: 3 Hours ***Friday November 14, 2003 a.***

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).

s/w type starter
o/l thermal starter

This paper consists of 4 printed pages.

SECTION A (10 marks)

Answer **ALL** questions in this section.

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

(i) The main causes of accidents in a workshop is

A students' lack of technical attitude
B fatigue of students and the teacher
C carelessness and ignorance
D teacher's absence in the workshop
E bad rules of the workshop.

(ii) The cable used for underground supply system is

A vulcanised rubber insulated
B mineral insulated metal sheathed
C mineral insulated copper sheathed
D armoured cable
E PVC cable.

(iii) The cable size and current rating of a domestic lighting circuit is

A 1.5 mm^2 and 5 A
B 2.5 mm^2 and 6 A
C 2.5 mm^2 and 13 A
D 3.5 mm^2 and 30 A
E 1.5 mm^2 and 10 A.

(iv) In a domestic electrical supply connection sequence, the following is supplied by the electric supply company (TANESCO):

A Cut-out and energy meter
B Earth leakage circuit-breaker and main switch
C Kwh-meter and main-switch
D Main-switch and cut-out
E Cut-out and main-switch.

(v) Polarity test is made in a new installation to ensure

A all switches, fuses and circuit-breakers are in the live wire
B all switches, fuses and circuit-breakers are connected to the neutral wire
C earth wire is well connected to the live wire
D all switches, fuses and circuit-breakers are electrically sound
E all poles of all switches are connected to the live wire.

(vi) The suitable type of switches for controlling one light or a group of lights from three different positions are

A two 2-way switches and one 1-way 1-gang switch
B two 2-way 1-gang switches and one intermediate switch
C one 2-way 2-gang switch and one intermediate switch
D two 2-way 2-gang switches and one 1-way 2 -gang switch
E two 2-way 2-gang switches and two 2-way 2-gang switches.

(vii) When measuring current, an ammeter is connected

A in parallel with the load
B in series-parallel with the load
C in series with the load
D in shunt with the load
E either in series or in parallel with the load.

(viii) The space factor for conduit installation is

A 30%
B 45%
C 60%
D 40%
E 35%.

(ix) A circuit is protected by a fuse of 5 A rating. If it has a fusing factor of 1.45 the minimum fusing current will be

A 3.45 A
B 6.25 A
C 7.25 A
D 10 A
E 7.0 A.

(x) Horse-power (HP) is a unit of real power. One HP is equal to

A 1,000 W
B 10,000 W
C 746 W
D 100 W
E 647 W.

SECTION B (30 marks)

Answer ALL questions in this section.

2. State three factors which determine the resistance of a conductor.

3. State three functions of a main-switch gear in an electrical installation.

4. Name three types of fuses used in the protection against excess current.

5. Show how current and voltage are measured in an electric circuit. Illustrate your answer by means of a simple diagram.

6. What is the purpose of the insulation resistance test in an electrical installation?

7. State three methods of starting a 3-phase squirrel-cage induction motor.

8. What is the function of a centrifugal switch in a single-phase a.c. motor?

9. Name three types of electrical power stations.

10. State two functions of a choke fitted in a low-pressure mercury vapour lamp.

11. Show by means of a circuit diagram, the star and delta connections of a 3-phase windings of a transformer.

SECTION C (60 marks)

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

12. (a) Outline two types of tests carried out or applied in a new transformer in order to detect losses.

    (b) By using circuit diagrams, show how the copper and iron losses are determined.

    (c) State two methods of cooling transformers.

13. (a) Outline three ways of transferring heat.

    (b) A domestic consumer requires an immersion heater for a tank containing 160 litres of water. The water has to be heated from 10 °C to 50 °C in three hours. If the efficiency of the heating system is 85%, calculate the nearest element size in kW. Take the specific heat capacity of water to be 4180 J per kg °C.

14. (a) Define armature reaction.

    (b) The no-load voltage of a shunt generator is 230 V and on-load voltage is 220 V. The field and armature resistance are 100 Ω and 0.05 Ω respectively. Calculate

    (i) load current

    (ii) armature voltage drop

    (iii) armature current

    (iv) field current.

15. (a) What precautions must be taken with respect to the load on a d.c. series motor?

    (b) A d.c. motor connected to a 460 V supply has an armature resistance of 0.15 Ω. Calculate

    (i) the value of back e.m.f. when armature current is 120 A

    (ii) the value of armature current when the back e.m.f. is 447.4 V.

16. (a) Explain the reason of using high voltage for transmission and distribution of electric energy.

    (b) Draw a simple circuit diagram of a three-phase four-wire a.c. system showing

    (i) a star point

    (ii) a single-phase supply (e.g. 240 V)

    (iii) a three-phase supply (e.g. 415 V).