

ELC – Electrical Technology

**T004**

Tuesday, 15/11/2016

08:30 – 11:30

WORKFORCE DEVELOPMENT AUTHORITY



P.O. BOX 2707 Kigali, Rwanda Tel: (+250) 255113365

---

**ADVANCED LEVEL NATIONAL EXAMINATIONS, 2016,  
TECHNICAL AND PROFESSIONAL STUDIES**

**EXAM TITLE: Electrical Technology**

**OPTION: Electricity (ELC)**

**DURATION: 3hours**

**INSTRUCTIONS:**

The paper is composed of **three (3) main Sections** as follows:

**Section I: Twenty-one (21) compulsory questions. 55 marks**

**Section II: Attempt any three (3) out of five questions. 30 marks**

**Section III: Attempt any one (1) out of three questions. 15 marks**

**Note:**

***Every candidate is required to carefully comply with the above instructions. Penalty measures will be applied on their strict consideration***

**Section I. Twenty-one (21) Compulsory questions****55marks**

- 
- 01.** Where and why are overload relays with manual reset used? **2marks**
- 02.** Where and why are overload relays with automatic reset used? **2marks**
- 03.** To what current must the overload relay be set? **4marks**
- 04.** When is it right for the overload relay to trip? **4marks**
- 05.** What do the following expressions mean for an electric motor?  
I<sub>e</sub>, I<sub>w</sub>, I<sub>b</sub>, I<sub>EM</sub>, Cos  $\phi$ , U<sub>e</sub>. **3marks**
- 06.** How does thermistor overload relay protect a machine? **3marks**
- 07.** For what event that a squirrel-cage rotor motor reaches the permissible temperature limit? **1mark**
- 08.** What is the advantage of having a multi-step starter for a motor? **3marks**
- 09.** What are the different types of single-phase transformer? **2marks**
- 10.** Why is the core laminated in power transformers? **1mark**
- 11.** Why the use of silicon steel in power transformers? **1mark**
- 12.** How is the cooling of transformers achieved? **1mark**
- 13.** What type of losses do we meet in transformers? **2marks**
- 14.** Define an autotransformer. **2marks**
- 15.** Define the following: **(a)** Electrical installation; **(b)** appliance; **(c)** insulation; **(d)** phase conductor; **(e)** neutral conductor; **(f)** cable. **3marks**
- 16.** List down at least SIX (6) types of switch used in domestic electrical installation. **3marks**
- 17.** How does master switching circuit operate? **3marks**
- 18.** Define and describe a relay. **3marks**
- 19.** What do NO and NC mean? **4marks**
- 20.** What is automatic switch? Give THREE (3) examples. **5marks**
- 21.** What are the key protection requirements for low voltage installation? **3marks**

**Section II. Choose and answer any three (3) questions.**

**30marks**

22. A) Compare the two types of turbo-alternators.  
B) What is the difference between direct-connected and direct-coupled alternators? **10marks**
23. Explain the effect of using many armature coils and more than one pair of magnetic poles in a practical DC generator. **10marks**
24. What are the causes of faulty starting of a synchronous motor? **10marks**
25. A) Sketch a diagram of a fluorescent lamp, and explain the way it produces light.  
B) A lamp giving out 1200 lm in all directions is suspended 8m above the working plane. Calculate the illumination at a point on the working plane 6m away from the foot of the lamp. **10marks**
26. What are the main faults that occur in DC machines and, how they can be detected? **10marks**

**Section III. Choose and answer any one (1) question.**

**15marks**

27. A) Give advantages and disadvantages of hydropower plant.  
B) Draw a schematic arrangement of hydropower plant. **15marks**
28. A) With the aid of diagrams explain how the speed of series, shunt and Compound-wound motors may be controlled.  
C) What are the conditions for connecting two single phase transformers in parallel? Draw that circuit. **15marks**
29. What is stroboscopic effect? And with the aid of diagrams give two methods to overcome stroboscopic effects. **15marks**

# BLANK PAGE