**ELC – Electrical Technology**

**T039**

**Tuesday, 04/11/2014**

**8:30 - 11:30 AM**

**WORKFORCE DEVELOPMENT AUTHORITY**

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# ADVANCED LEVEL NATIONAL EXAMINATIONS, 2014
# TECHNICAL AND PROFESSIONAL TRADES

**EXAM TITLE:** **ELT – Electrical Technology**

**OPTION:** **ELECTRICITY (ELC)**

**DURATION:** **3hours**

**INSTRUCTIONS:**

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

Section **I**: Fifteen **(15)** questions, all **Compulsory**. **55marks**

Section **II**: Five **(5)** questions, **Choose any Three (3).** **30marks**

Section **III**: Three **(3)** questions, **Choose any One (1).** **15marks**

## SECTION I. FIFTEEN (15) COMPULSORY QUESTIONS.

**01.** Give three (3) reasons why alternating current (a.c) is used in the generation and transmission of electronic power. **3marks**

**02.** When does an electrical shock occur? **3marks**

**03.** An alternating voltage (a.v) is given by 12sin 50 Calculate the r.m.s and draw the wave form. **6marks**

**04.** Draw a line diagram of a manual switch with overload protection and a float switch controlling a pump motor for "pump" operation. **4marks**

**05.** For an R-L series a.c circuit, draw:

(a) a circuit diagram

(b) phasor diagram

(c) voltage diagram

(d) impedance diagram. **4marks**

**06.** A 6V battery is connected in series with 20Ω, 15Ω and 25Ω resistors. Find the voltage flowing in each resistor **2marks**

**07.** Define the following expressions:

a) A motor starter.

b) A contactor. **4marks**

**08.** Differentiate conductors from insulators. **4marks**

**09.** Draw a well labeled circuit diagram for an inverting amplifier. **6marks**

**10.** What are the three different types of magnetic contactors? **3marks**

**11.** A current through a coil increases from 20A to 60A in 0.05 seconds and an e.m.f (e) of 30V is induced. Find the inductance of the coil. **3marks**

**12.** Where can a differential compound d.c motor be used? **2marks**

**13.** A factory has a 240-V supply from which the following loads are taken :

Lighting: Three hundred 150-W lamps, four hundred 100 W lamps and five hundred 60-W lamps

Heating: 100 kW

Motors: A total of 44.76 kW with an average efficiency of 75 percent

Misc. : Various load taking a current of 40 A.

Assuming that the lighting load is on for a period of 7hours/day, the heating for 16hours per day and the remainder for 3hours/day, calculate the weekly consumption of the factory in kWh when working on a 7-day week. **5marks**

**14.** According to the way the primary and the secondary windings are placed around the core, explain the types of transformers. **3marks**

**15.** Mention three (3) things that you can do as technician to maintain tools and electrical equipments in good conditions. **3marks**

**SECTION II. ATTEMPT ANY THREE (3) QUESTIONS.**

**16.** A coil of resistance 8 and inductance 140mH in series with a 150 capacitor is connected to a 240V, 50Hz supply.

Calculate:

(a) the current flowing

(b) the phase difference between the supply voltage and current;

(c) the voltage across the coil

(d) the voltage across the capacitor **10marks**

**17.** Using sketches show how a field rheostat or armature rheostat could be used to adjust the speed of a dc shunt motor. **10marks**

**18.** (a) With the aid of a labeled circuit diagram, explain how an earth electrode is installed **6marks**

(b) Give and explain any two (2) applications of earthing. **4marks**

**19.** a) Classify AC motors according to their principle of operation. **5marks**

b) Describe a d.c generator. **5marks**

**20.** Use Kirchhoff's law to determine the currents flowing in each branch of the network shown in figure1 below: **10marks**

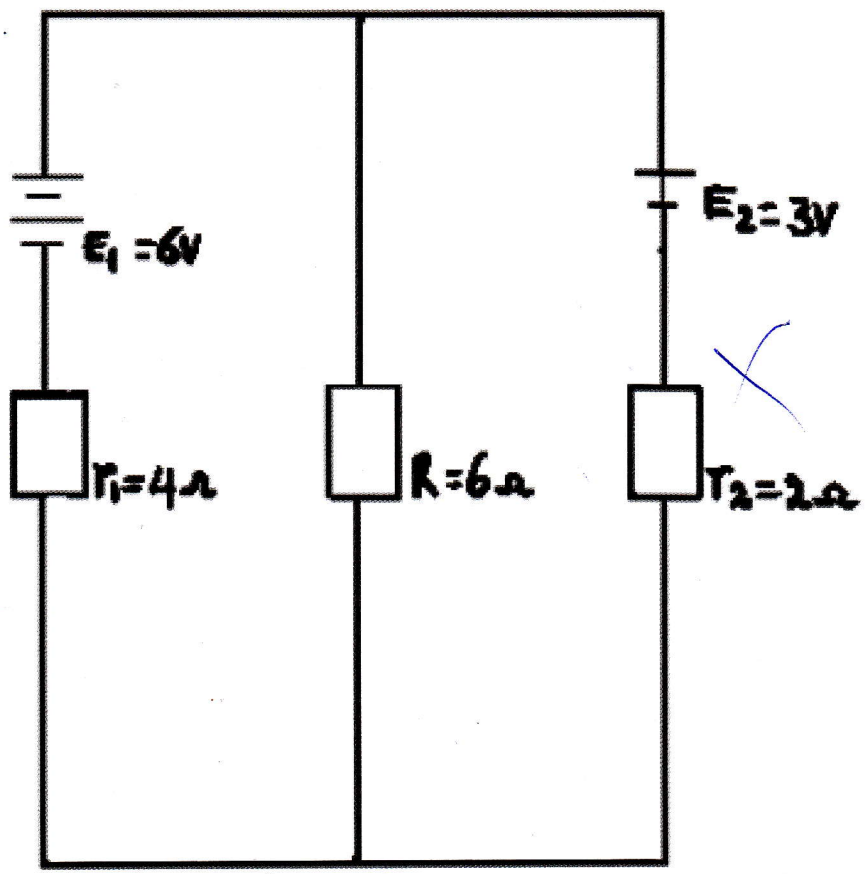


Fig. 1

**SECTION III. ATTEMPT ANY ONE (1) QUESTION.**

**21.** a) Make classification of all losses which take place in a DC generator.

b) A 4-pole, Lap-connected d.c. machine has an armature resistance of 0.15 ohm. What will be the armature resistance of the machine if it is rewound for wave-connection? Justify by connections diagrams. **15marks**

**22.** Two battries, each of e.m.f 10V and internal resistance 0.5Ω are connected in:

(i) series ; (ii) parallel to supply a load which has a resistance of 4Ω.

(a) make circuit diagrams of these circuit connections. **6marks**

(b) calculate the current and voltage across the load in each case. **9marks**

**23.** Draw and explain the autotransformer starting circuits. **15marks**