

ELC – Electrical Technology

T040

Tuesday, 17/11/2015
08:30 – 11:30

WORKFORCE DEVELOPMENT AUTHORITY



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**ADVANCED LEVEL NATIONAL EXAMINATIONS, 2015,
TECHNICAL AND PROFESSIONAL TRADES**

EXAM TITLE: Electrical Technology

OPTION: ELECTRICITY (ELC)

DURATION: 3hours

INSTRUCTIONS:

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

Section **I:** Sixteen **(16)** questions, all **Compulsory.** **55marks**

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

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

Every candidate is requested to strictly obey the above instructions. Punishment measures will be applied to anyone who ignores these instructions.

Section I. Sixteen (16) Compulsory questions. 55marks

01. Define a contactor. **2marks**
02. What are the different circuits found in an installation with contactors? Compare the currents absorbed by those two circuits. **3marks**
03. List down Five (5) advantages of contactors. **5marks**
04. By what contactors are they rated? **4marks**
05. In a control with contactors the action on the start push button remains without result, what are the probable causes?(list down at least four). **5marks**
06. What are the two (2) types of relays? **2marks**
07. List down the different types of over current relays. **3marks**
08. What are the different ways of reactivating an over current relay? **4marks**
09. What is the meaning of the following abbreviations:
(a) SPST; (b) SPDT; (c) DPST; (d) DPDT. **4marks**
10. What are the different manners used to extinguish the arc in a contactor? **5marks**
11. What does the following mean?
MCB *Miniature Circuit Breaker*
MCCB *Molded Case Circuit Breaker* **2marks**
12. Classify the medium-voltage circuit breakers. **3marks**
13. Define RCD and give its other name. **4marks**
14. List down Three (3) types of RCD depending on the characteristics of the fault current. **5marks**
15. How to reduce the effects of armature reaction in a DC generator? **3marks**
16. What is Eddy current in a generator? **1mark**

Section II. Answer any three (3) questions of your choice.

(Do not choose more than three questions). 30marks

17. a) Explain all the losses occurring in a transformer and their origins.
b) A 100 kVA power transformer feeds a load operating at a power factor of 0.8. Find the efficiency of the transformer if the combined iron and copper loss at this load is 1 kW. **10marks**
18. A discharge lamp is suspended from a ceiling 4 m above a bench. The illuminance on the bench below the lamp was 300 lx. Find:
(a) the luminous intensity of the lamp
(b) the distance along the bench where the illuminance falls to 153.6 lx. **10marks**
19. Briefly describe how a three-phase supply produces a rotating force or torque in an induction motor. **10marks**
20. Describe how the following protections are provided in an electrical installation:

- a) protection against electric shock,
- b) protection against over current.

10marks

21. Why is power factor improvement necessary for motor circuits?

10marks

Section III. Answer any one (1) question of your choice

(Do not choose more than one question). 15marks

22. Give the meaning of "a hold-on circuit" and sketch/draw the following circuit diagrams:

- (i) a simple diagram of a hold-on circuit with brief explanation of its model of operation;
- (ii) a simple circuit diagram for a single phase motor starter incorporating a hold-on circuit.

15marks

23. a) A transformer has 400 primary turns and 200 secondary turns. The primary and secondary resistances are 0.40Ω and 0.20Ω respectively. The corresponding leakage reactances are 3.0Ω and 0.6Ω respectively. Determine:

- (i) the equivalent resistance referred to the primary winding;
- (ii) the equivalent reactance referred to the primary winding;
- (iii) the equivalent impedance referred to the primary winding.
- (iv) the phase angle of the impedance.

b) Define an electric power supply system and give one (1) main advantage Of AC transmission and distribution.

15marks

24. (a) Explain briefly what happens when the secondary terminal of a transformer is loaded.

(b) A 15KVA, 200V/400V single phase transformer has a secondary terminal voltage of 388V when loaded. Determine the regulation of the transformer.

(c) The open circuit voltage of a transformer is 240V. A tap changing device is set to operate when the percentage regulation drops below 2.6%. Determine the load voltage at which the mechanism operates.

15marks

fault
 $\frac{R}{Z}$ $\frac{X_L - X}{Z}$ *uncontrolled*
 $\frac{R}{Z}$ $\frac{X_L - X}{Z}$ *controlled*
 $\frac{R}{Z}$ $\frac{X_L - X}{Z}$ *controlled*