ADVANCED LEVEL NATIONAL EXAMINATIONS, 2014
TECHNICAL AND PROFESSIONAL TRADES

EXAM TITLE: Applied Electronics

OPTION: Electricity (ELC)

DURATION: 3 hours

INSTRUCTIONS:

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

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

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

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

- You are allowed to use a calculator.
SECTION I. SIXTEEN (16) COMPULSORY QUESTIONS.

01. Determine the value of a resistor characterized by the following colors: Gray - Blue - yellow - silver - violet. 3marks

02. What are the main groups of elements in a cathode Ray tube? 3marks

03. Using the rule of Boolean algebra, simplify the following expression:
   \[ F = \overline{KLM} + \overline{KLM} + \overline{KLM} + LKM \] 4marks

04. Discuss the difference between capacitor and inductor. 4marks

05. A 50V DC voltage source supplies a 50Ω resistor connected in series with a 50nF. What is the time required so as this capacitor is fully charged?
   Determine this time when the capacitor is replaced by a 50mH Inductor. 5marks

06. What is the disadvantage of a push-pull amplifier circuit? Show the wave form through its output. 6marks

07. In which bias conditions is operated:
   (a) a photodiode 4marks
   (b) a LED

08. Explain how you can test each of the following electronic components:
   (a) transformer 6marks
   (b) inductor

09. Identify the important characteristics of:
   a. The emitter follower amplifier 2marks
   b. Darlington amplifier. 3marks

10. A resistor used in colour TV has the following colour bands: yellow, violet, orange and silver. Determine its nominal value. 3marks

11. Identify three different ways that an SCR or a TRIAC may be triggered into its “on” (conducting) state. 3marks
12. Give the expression of Duty Cycle in terms of input and output voltage for each of the following functions:

a) Buck converter circuit
b) Boost converter circuit
c) Inverting circuit

13. A variable air capacitor has 11 movable plates and 12 stationary plates. The area of each plate is 0.0015m² and separation between opposite plates is 0.001m. Determine the maximum capacitance of this variable capacitor.

14. A 35Vd.c. supply is connected across a resistance of 600Ω in series with an unknown resistance R. A voltmeter having a resistance of 1200Ω is connected across 600Ω and shows a reading of 5V. Calculate the value of resistance R.

15. Draw the circuit of an OPAMP V-to-I converter with grounded load and derive the equation for the current through the load.

16. Describe three among the advantages of using a solid-state relay for switching AC power instead of using an electromechanical relay.

SECTION II. ANSWER ANY THREE (3) QUESTIONS.

17. Draw the circuit of four diode full wave bridge rectifier and show the direction of currents in each branch. Give its advantages and disadvantages.

18. Explain the classification of amplifiers based on frequency response and sketch the corresponding diagram.

19. Establish a block-diagram of the structure of an analog to digital converter (ADC) for successive approximation register type.

20. Identify the functional features of a power bipolar junction transistor.

21. Explain the effect of avalanche break down on pn junction.
SECTION III. ANSWER ANY ONE (1) QUESTION.

22. Design a tristates 4 inputs multiplexer. 15marks

23. a) Describe the general working of the circuit below: 10marks

![Circuit Diagram](image)

b) Name the above circuit. 2marks

c) What is the function of the comparator? 3marks

24. A triangular wave shown in fig (1) is applied to the circuit in fig (2). Explain the working of the circuit. Sketch the output waveform. 15marks

![Waveform](image)

**Fig (1)**

![Circuit Diagram](image)

**Fig (2)**