CEL&ETL – General Electronics

T014

Thursday, 29/11/2018

08:30 – 11:30 AM

WORKFORCE DEVELOPMENT AUTHORITY

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ADVANCED LEVEL NATIONAL EXAMINATIONS, 2018, TECHNICAL AND PROFESSIONAL STUDIES

EXAM TITLE: **GENERAL ELECTRONICS**

OPTIONS: **Computer Electronics (CEL)**

Electronics and Telecommunication (ETL)

DURATION: **3 hours**

INSTRUCTIONS:

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

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

01. In most of electronic components ,semiconductors are preferable than conductors and insulators. Explain why? **(3 marks)**

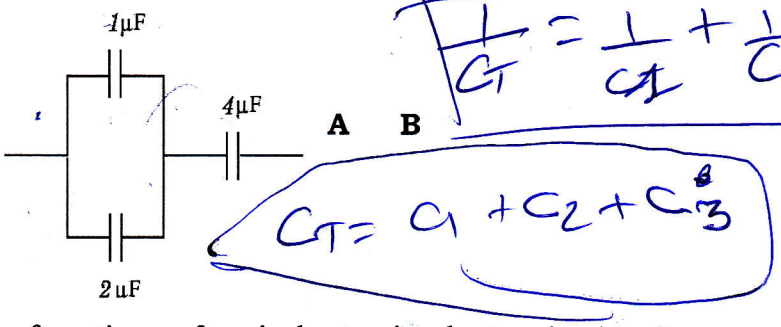
02. When do you say that a pn junction diode is forward biased? **(4 marks)**

03. BJT are bipolar whereas UJT are unipolar.What does it mean? **(4 marks)**

04. **a**)Define Optoelectronics.

b) What are the two main categories of optoelectronic devices? Give an example for each case. **(6 marks)**

05. Find the equivalent capacitance between point A and B of the following circuit:



$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$ Parallel

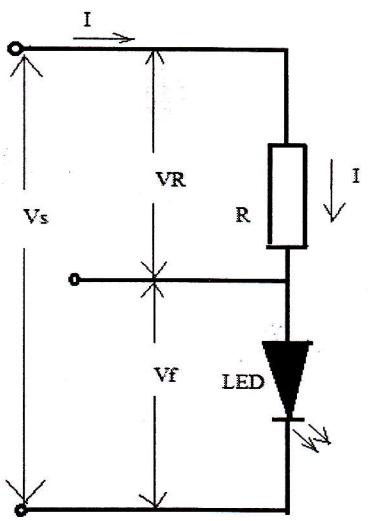
$C_T = C_1 + C_2 + C_3$ Series

(3 marks)

06. State two functions of an inductor in electronic circuits. **(3 marks)**

07. Which one is more doped between collector and emmiter of NPN transistor? Explain your answer. It is C **(3 marks)**

08. Within an MP3 player design the indicator part is shown on the diagram below:



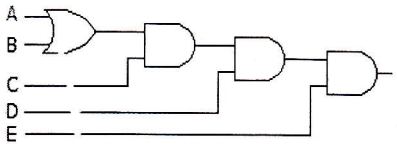
The datasheet of LED indicates that the limited current varies from 20mA to 100mA and the forward biased voltage is 1.8V. If the device will operate with a 3.7V battery, calculate the minimum and maximum value of the current limitting resistor R. **(4 marks)**

$I_F = 20 \times 10^{-3} A$
$I_Z = 100 \times 10^{-3}$
$V = 1.8 V$
$V_{in} = 3.7$

$\frac{1}{2} \cdot \frac{0.5}{\times 10^6} = .$

$I_T = \frac{V_s}{V_T}$ $\left(\frac{R_2}{R+R_2}\right) V_T$

09. Derive the Boolean expression for the logic circuit shown below:



(2 marks)

10. Draw the logic circuit using three NOR gates which outputs the following function: Y=AB **(3 marks)**

11. Give the range of the following resistor: Red Red Brown Silver . **(4 marks)**

12. **a)**Define a multimeter accuracy.

b)The datasheet of a multimeter shows that its accuracy is 1%. A technician has measured the voltage and found 220Volts. What is the actual voltage?

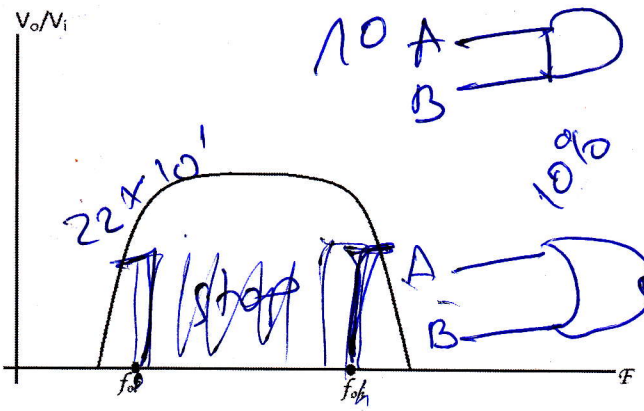
(4 marks)

13. What is the purpose of a filter circuit in common sens? **(3 marks)**

14. What does express the ratio Ic/Ie or α or the transport factor of a transistor? How is it affecting the quality of a transistor? **(3 marks)**

15. How are photo-FETs activated? **(2 marks)**

16. What type of filter does present the wave diagram below? Give one application of such a filter.



(4 marks)

Section II. Choose and answer any three (3) questions. **30 marks**

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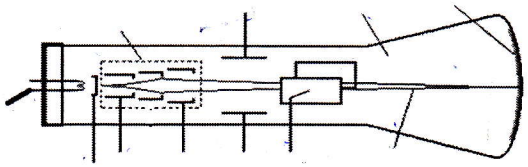
17. Put the names (or label) of part of Cathode ray Oscilloscope as shown by short lines below: **(10 marks)**



18. Simplify the following expression using Boolean algebra technique

Z = AB + A (B + C) + B (B + C) **(10 marks)**

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19. Explain the mode of operation of a potentiometer. **(10 marks)**

20. A transistor operating in CB configuration has I_C = 2.98 mA, I_E = 3.00 mA and I_{CO} = 0.01 mA. What current will flow in the collector circuit of this transistor when connected in CE configuration with a base current of 30 μA? **(10 marks)**

21. A. What are the important specification of a digital-to-analog (D/A) converters do you base on during their selection?

B. Calculate the produced output voltage of a 10-bit digital-to-analog (D/A) converter having an output range from 0-9v when the input binary number is 1110001010. **(10 marks)**

Section III. Choose and answer any one (1) question. 15 marks

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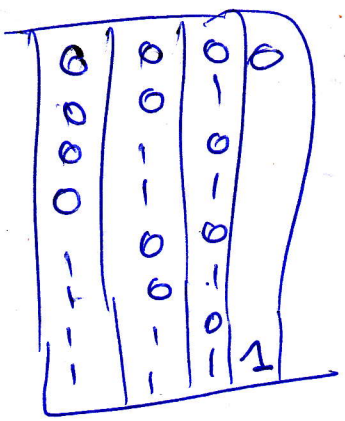
22. A crystal diode having internal resistance r_f = 20Ω is used for half-wave rectification. If the applied voltage v = 50 sin ωt and load resistance R_L = 800 Ω, find: (i) Im, Idc, Irms

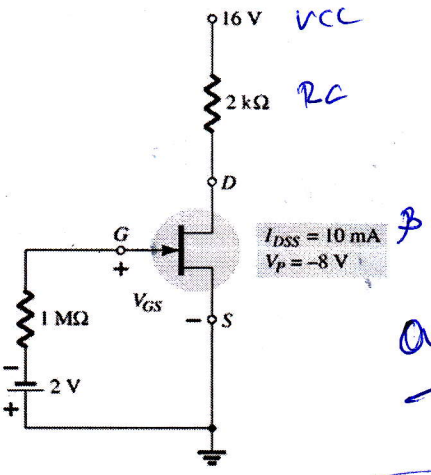
(ii) a.c. power input and d.c. power output

(iii) d.c. output voltage

(iv) Efficiency of rectification. **(15 marks)**

23. The circuit below is JFET fixed bias. Determine: (a) V_{GS}, (b) I_D, (c)V_{DS}, (d) V_D, (e) V_G and (f) V_S. **(15 marks)**





24. Design a 3-input (A,B,C) digital circuit that will give at its output (X) a logic 1 only if the binary number formed at the input has more ones than zeros.

a) Find the corresponding truth table,

b) Find output expression,

c) Simplify the output expression using K-map,

d) Draw the logic circuit. **(15 marks)**