NESA NATIONAL EXAMINATION AND SCHOOL INSPECTION AUTHORITY

ELS– Fundamentals of Electronics

T077

Tuesday, 20/7/2021

08:30 – 11:30 AM

Names:.....

Index number:.....

TVET NATIONAL EXAMINATION, RTQF LEVEL 5, 2020-2021

QUESTIONS and ANSWERS BOOKLET

OPTION/TRADE: **ELECTRONIC SERVICES**

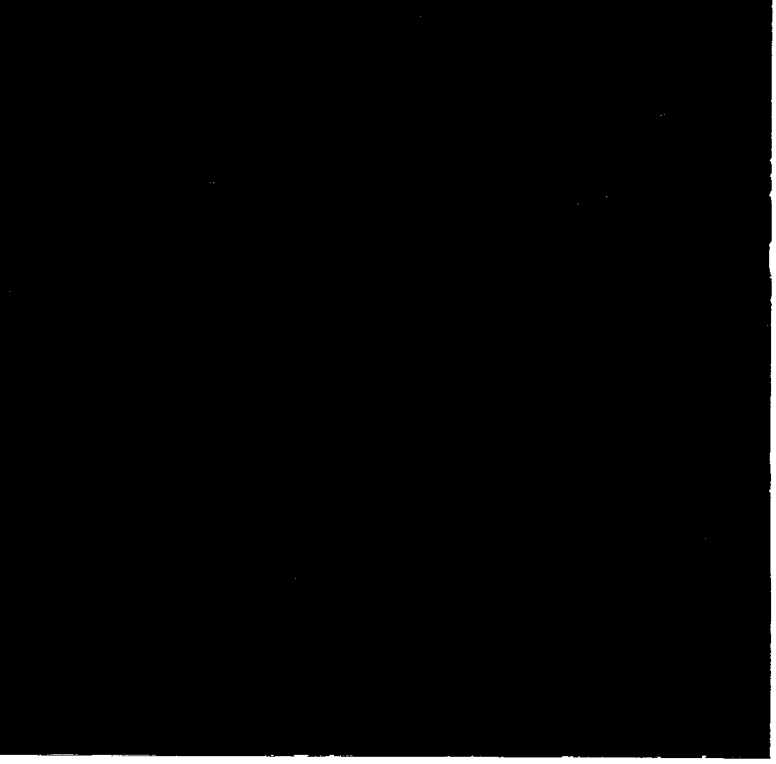
SUBJECT: **Fundamentals of Electronics**

ACADEMIC YEAR: **2020-2021**

Read carefully the instructions on page (i) & (ii).

FOR EXAMINER'S USE ONLY

QUESTIONS	1	2	3	4	5	6	7	8	9	10	Total
Marks											
QUESTIONS	11	12	13	14	15	16	17	18	19	20	Total
Marks											
QUESTIONS	21	22	23	24	25	26	27	28	29	30	Total
Marks											



TVET NATIONAL EXAMINATION, RTQF LEVEL 5, 2020-2021

INSTRUCTIONS TO CANDIDATES: PART I (Answer Booklet)

1. A candidate should fill in the actual names and the index number on the cover of this questions and answer booklet on the provided place (Black Box).

2. It is illegal for a candidate to write any of his/her names, index number or a school name inside the answer booklet.

3. A candidate should check if all pages of the answer booklet are complete. No candidate should remove or tear any pages or part of it from the answer booklet.

4. A candidate should answer in the language in which the examination is set. (See page ***(ii)***)

5. A candidate should sign on the sitting plan when submitting the answer booklet. He/she has also to check if the answer booklet is well sealed.

6. No extra paper is allowed in the examinations room. If a candidate is caught with it his/her results will be nullified.

7. No candidate is allowed to write answers not related to the subject being sat for, otherwise it will be considered as a cheating case.

8. Write your answers on the 12 lined pages (From page 1 of 12 to page 12 of 12).

9. Use the last non-lined pages as draft.

10. Results for any candidate who is caught in examination malpractices are nullified. The cheating can be recognized during examinations administration, marking exercise or even thereafter.

TVET NATIONAL EXAMINATION, RTQF LEVEL 5, 2020-2021

OPTION/TRADE: ELECTRONIC SERVICES

SUBJECT: Fundamentals of Electronics

DURATION: 3 hours

INSTRUCTIONS TO CANDIDATES:PART II (Question Paper)

The paper is composed of two (2) main Sections as follows:

Section I: Attempt all the Twelve (12) questions	**(60 marks)**
Section II: Attempt any Four (4) questions out of Six (6)	**(40 marks)**

Allowed materials:

-Ruler and square
-Calculator

Note:

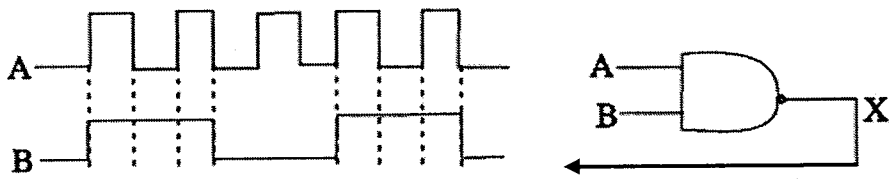
Every candidate is required to carefully comply with the provided assessment instructions.

Section I: Attempt all the Twelve (12) questions (60 marks)

01. What decimal number is represented by the BCD string given below? 010000000010. **(4 marks)**

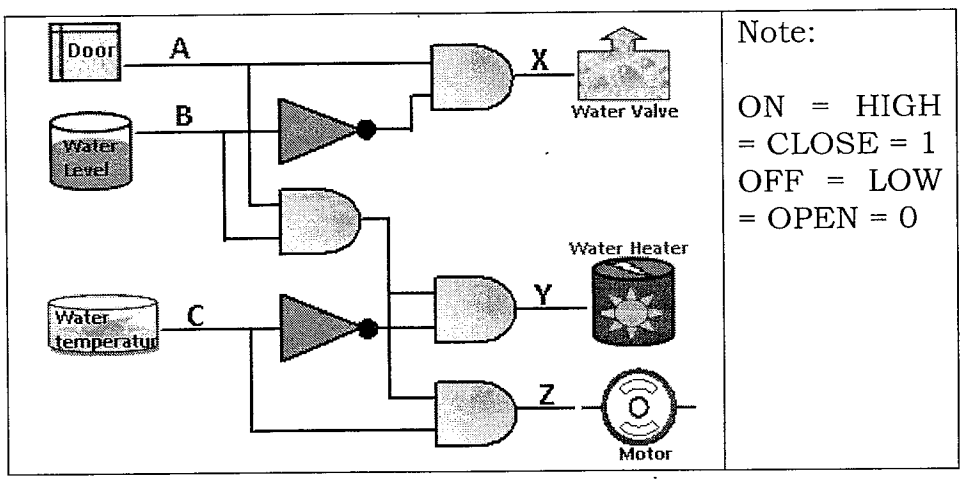
02. **a)** Draw the typical inverter circuit having A as an input and Y as an output.
b) Derive the Truth table for the above inverter
c) Draw the gate symbol for the mentioned inverter. **(5 marks)**

03. The NAND gate below has two waveforms A and B applied to its inputs. Determine the resulting output waveform. **(5 marks)**



04. Calculate the equivalent capacitance of two capacitors of 6μf and 4μf connected: **(5 marks)**
a. In parallel
b. In series

05. The circuit below illustrates how a digital circuit can be used to control the water valve, water heater and motor. Analyze it and answer to questions by TRUE or FALSE.



i) The motor rotates depending on water temperature and water level only
ii) The water heater boils water when the water temperature is reduced, the water level is too low and the door is closed.
iii) The water valve controls the flow of water, when water level is low and the door is closed.

iv) The water level, being high or low, is a key element in functioning both the water valve, water heater and motor. **(6 marks)**

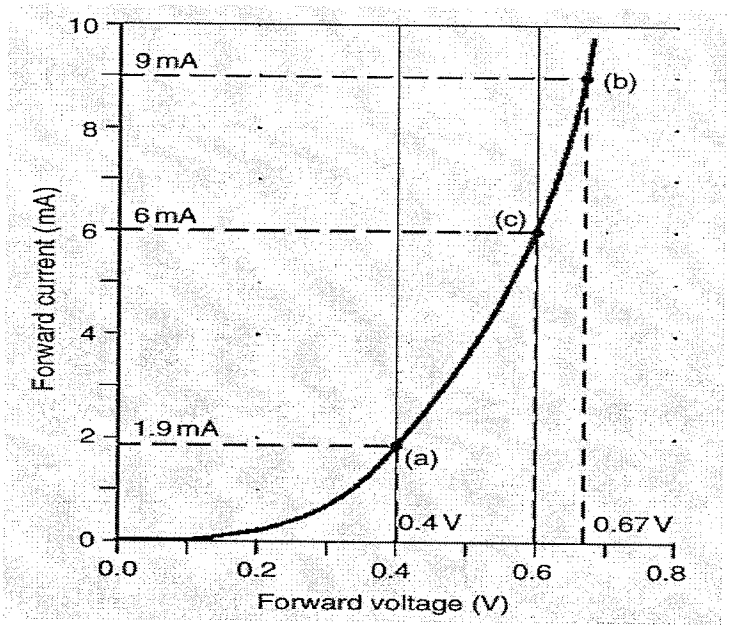
06. Give the range of the following resistor: Red Red Brown Silver . **(4 marks)**

07. Explain how to test a diode using a digital multimeter. **(5 marks)**

08. Differentiate conductor, semi-conductor and insulator. **(6 marks)**

09. **a.** Name the pins of a transistor.
b. What are the functions of a transistor? **(5 marks)**

10. The forward characteristic of a diode is shown in figure below:



Use the characteristic to determine:

(a) the current flowing in the diode when a forward voltage of 0.4 V is applied,

(b) the voltage dropped across the diode when a forward current of 9 mA is flowing in it,

(c) the resistance of the diode when the forward voltage is 0.6 V, and
(d) Whether the diode is a Ge or Si type. **(5marks)**

11. 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? **(5 marks)**

12. Prove the following Boolean identity: **(5 marks)**

$$(A+B)(A+\overline{B})(\overline{A}+C)=AC$$

Section II: Attempt any Four (4) questions out of Six (6) (40 marks)

13. a) Differentiate Byte from bit. **(2 marks)**

b) Convert the hexadecimal number EB4A to the corresponding decimal number. **(2 marks)**

c) Convert the following decimal numbers into binary numbers. **(6 marks)**

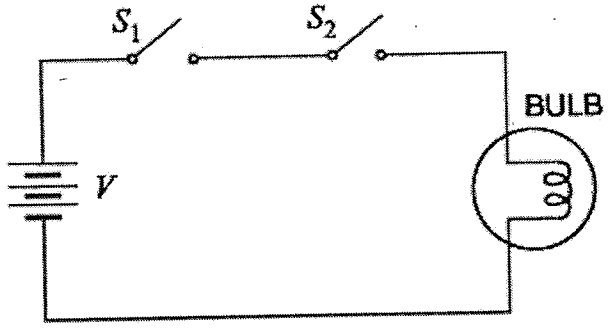
(i) 59
(ii) 39
(iii) 584

14. a) Convert the following SOP expression to an equivalent POS expression. **(3 marks)**

$$A\,B\,C+A\,\overline{B}\,\overline{C}+A\,\overline{B}\,C+A\,B\,\overline{C}+\overline{A}\,\overline{B}\,C$$

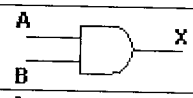
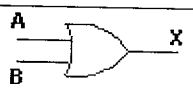
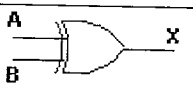
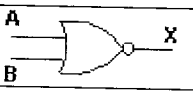
b) Differentiate passive component from active component and give two examples for each component. **(7 marks)**

15. Observe the circuit shown below and give the name of logic gate that corresponds to it. If the bulb is the output, make a truth table for the circuit basing on different states of S_1, S_2, and bulb.



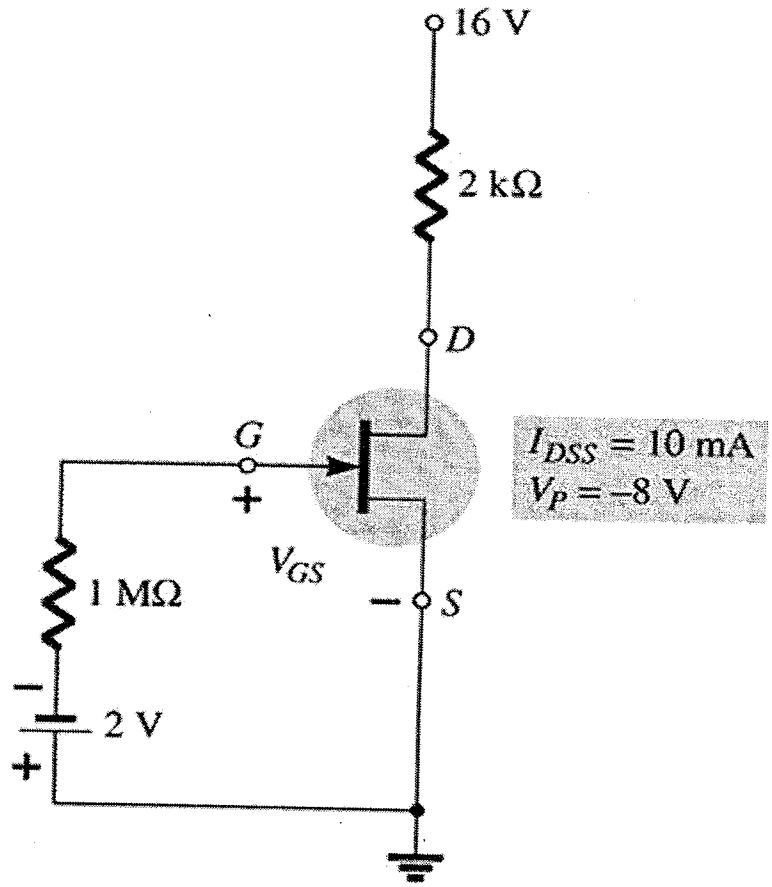
(10 marks)

16. Match each statement with a logic gate. **(10 marks)**

A. Produces a 0 only if all its inputs are 0 and a 1 otherwise.	1)	
B. Produces a 0 only of its inputs are the same and a 1 otherwise.	2)	
C. Produces a 1 only if all its inputs are 1, otherwise it produces 0	3)	
D. Produces a 0 of all its inputs are all 1 and a 1 otherwise.	4)	

17. Explain how to test an electronic Relay using a digital multimeter. **(10 marks)**

18. 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. **(10 marks)**



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