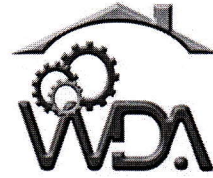


**CEL&ETL - Analog and Digital
Systems
T090**

**Friday, 11/11/2016
02:00 – 05:00 PM**

WORKFORCE DEVELOPMENT AUTHORITY



P.O. BOX 2707 Kigali, Rwanda Tel: (+250) 255113365

**ADVANCED LEVEL NATIONAL EXAMINATIONS, 2016,
TECHNICAL AND PROFESSIONAL STUDIES**

EXAM TITLE: Analog and Digital Systems

**OPTIONS: Computer Electronics (CEL)
Electronics and Telecommunication (ETL)**

DURATION: 3hours

INSTRUCTIONS:

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

Section I: Fifteen (15) compulsory questions. 55 marks

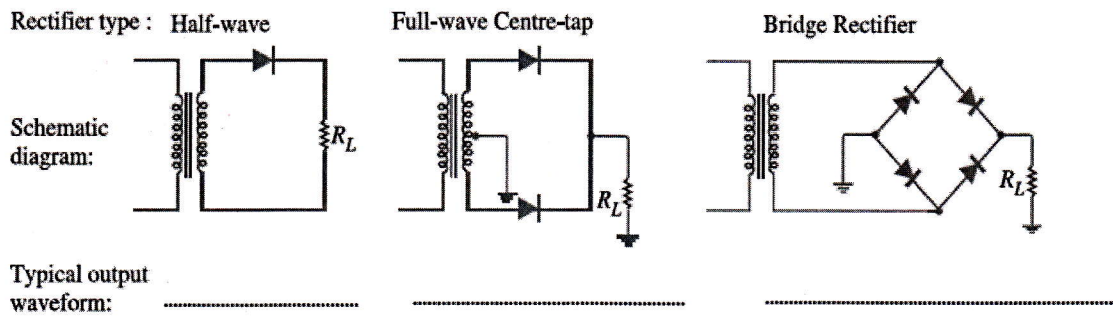
Section II: Attempt any three (3) out of five questions. 30 marks

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.

01. Draw the output waveform for each rectifier type from the figure below? **3marks**



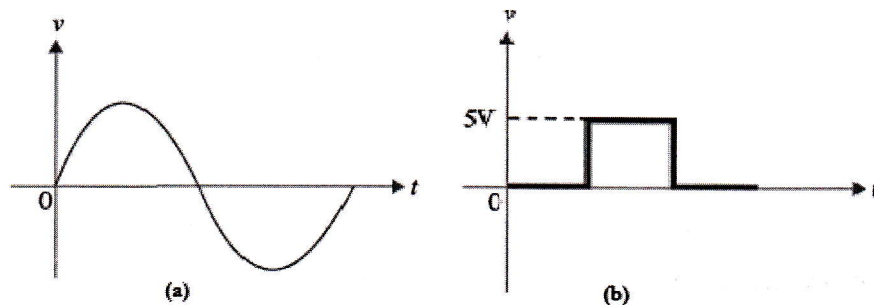
02. Convert the binary number $(1001.0101)_2$ into its equivalent decimal number? **4marks**

03. Give the next **three** numbers of the following hexadecimal sequence:

4A5, 4A6, 4A7, 4A8, ... ;;.....;.....;

3marks

04. From the given two signals in figure (a) and (b), which one is analog and which one digital? **4marks**



05. In Boolean algebra, the bar sign (-) indicates (choose the answer) (OR operation, AND operation, NOT operation, nothing). **2marks**

06. What are the **three** basic logic gates? **3marks**

07. Define a filter. **2marks**

08. Simplify the following Boolean expression: **4marks**

$$Y = \overline{A} \overline{B} D + \overline{A} \overline{B} \overline{D}$$

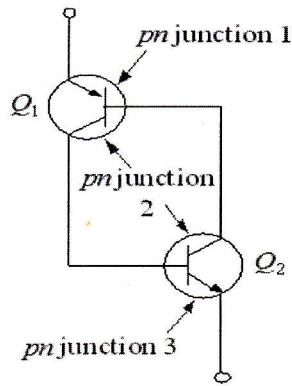
09. Give the two ways to drop the SCR out of conduction? **4marks**

10. The SCR can conduct current if **4marks**

- ▶ the anode-to-cathode voltage exceeds V_{BR}
- ▶ a current pulse is applied to the gate
- ▶ both a and b are correct
- ▶ none of the above

11. Give the name of the two terminals shown in figure below:

4marks

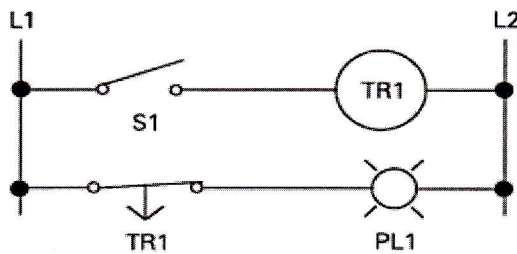


12. What are the basic elements of a PLC?

4marks

13. From the figure below, explain the operation of an **off-delay, timed closed timer**, also called a **normally closed, timed closed (NCTC) timer**. The timing relay (TR1) has been set for 5 seconds.

6marks



14. Depending upon the methodology of programming, erasing and reprogramming information into ROMs, classify the types of ROM.

5marks

15. Provide at least three advantages of digital electronics system.

3marks

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

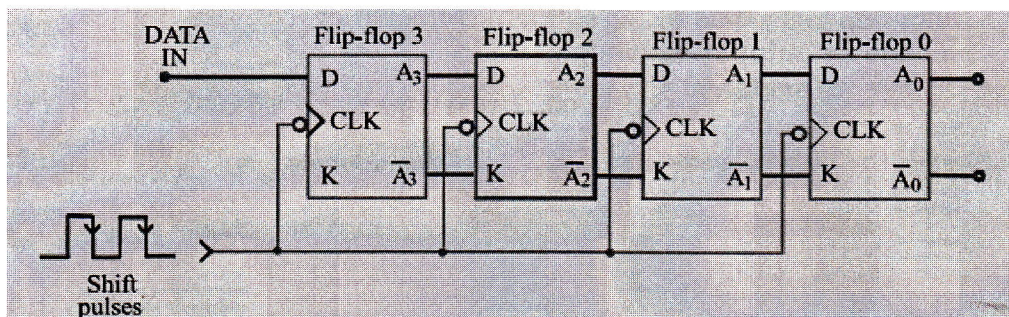
30marks

16. List out five (5) scale of integration, describe them with their density.

10marks

17. Learn the register below give its name and explain it by using waveform

10marks



18. List out five (5) difference between latch and flip-flop.

10marks

(Put the difference on the table as indicated below).

Latch	Flip-flop
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

19. Find the convenient answers to the following questions:

- Give the internal construction and logic symbol of JK flip flop.
- Explain and give modification, internal construction, logic symbol and truth table done from JK flip flop to D flip flop.

10marks

20. Using the truth table; implement the following Boolean expression using minimum number of 3-input NAND gates. (Where: 1, 2, 3, 4, 7, 9, 10, 12 are decimal numbers)

$$f(A, B, C, D) = \Sigma (1, 2, 3, 4, 7, 9, 10, 12)$$

10marks

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

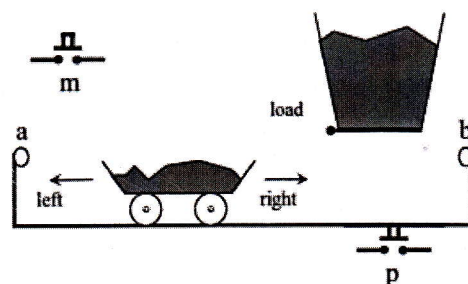
15marks

21. The control system as PLC has the following question, explain them.

- Define a PLC.
- By a net sketch explain the working principle of PLCs.
- List out any advantages of PLCs.
- Explain the architecture of PLCs.
- Explain the process of scanning of PLCs.

15marks

22. The modeling SFC control below shown the modeling control/automation of lifting a load from right to left in industry of furnace Learn it, identify the elements contain with this system and Draw the SFC scripts of this control system.



15marks

23. A wired J-K flip-flop below has 8KHZ as input n frequency

- Calculate its output frequency.
- Calculate its modulus.
- What is modulus?
- Sketch the output waveform

15marks

