CEL & ETL – Analog and Digital Systems

T005

Friday, 31/10/2014

01:30 - 04:30 PM

WORKFORCE DEVELOPMENT AUTHORITY

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ADVANCED LEVEL NATIONAL EXAMINATIONS, 2014
TECHNICAL AND PROFESSIONAL TRADES

EXAM TITLE: **Analog and Digital Systems**

OPTIONS: **- Computer Electronics (CEL)**

- Electronics and Telecommunication (ETL)

DURATION: **3hours**

INSTRUCTIONS:

The paper consists of **three (3) Sections** :

Section **I**: Fourteen **(14)** questions, all **Compulsory**.	**55marks**
Section **II**: Five **(5)** questions, **Choose any Three (3)**.	**30marks**
Section **III**: Three **(3)** questions, **Choose any One (1)**.	**15marks**

SECTION I. FOURTEEN (14) COMPULSORY QUESTIONS.

01. Find the canonical form of the following Boolean expression :

F(A,B,C) = AB + BC. **3marks**

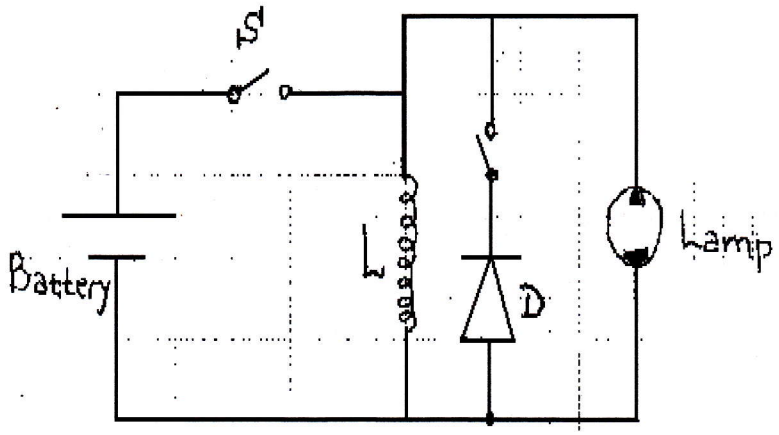
02. Design a D flip-flop from a J-K flip-flop. **2marks**

03. What should be done to unused inputs on TTL gates? **5marks**

04. Which functions a GTO gate drive circuit has to fulfill? **4marks**

05. Identify two (2) different methods to represent basic logic functions. **2marks**

06. Explain the functioning of the following circuit by turning ON and switch off quickly that circuit :



a) Without diode; b) With diode mounted. **4marks**

07. Identify the component of a typical transducer measurement system bloc (output digital). **5marks**

08. Identify the components of the 555 timer. **5marks**

09. Identify any five (5) methods of thyristor turn on. **5marks**

10. Specify two (2) different methods of voltage control inverters. **2marks**

11. Describe the function of freewheeling diode in a controlled rectifier circuit. **3marks**

12. Identify any five (5) characteristics of an amplifier that are modified by negative feedback. **5marks**

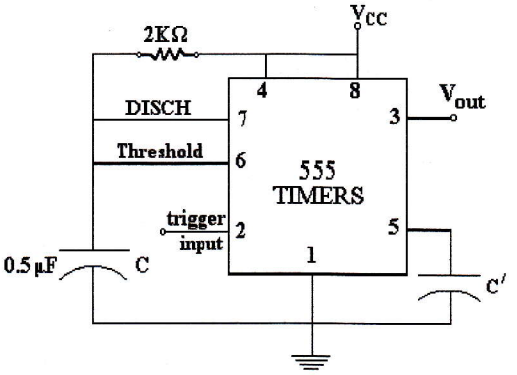
13. Simplify the following expression using Boolean algebra technique

Z = AB + A (B + C) + B (B + C). **5marks**

14. Identify five (5) applications of AC voltage controllers. **5marks**

SECTION II. ATTEMPT ANY THREE (3) QUESTIONS.

15. a) Find the period (in msec) of the output pulse in the circuit shown below and give a name at this circuit. **5marks**

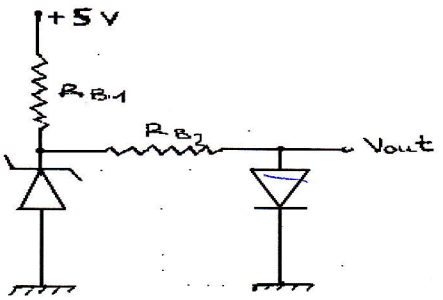


b) Show how a full adder may be implemented by using two half adders. **5marks**

16. Describe the basic operation of a single-slope analog to digital converter. **10marks**

17. Identify the logic families according to the technology they are built with and specify which family is widely used. **10marks**

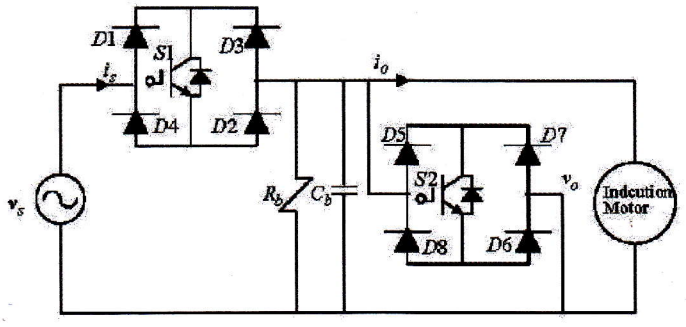
18. In the following circuit, the specifications of zener diode at 25°C are: **(1°)** bias current: 10mA; **(2°)** output voltage: 2495mV
The diode is forward biased at 2mA with forward voltage drop of 0.55V;



Determine R_{B1} and R_{B2} and select both values of resistors from the list of 1% decade values. **10marks**

19. a) For the circuit below, determine the function performed; the role of S1, Rb, Cb and S2.

b) Determine different modes of operation of that circuit. **10marks**



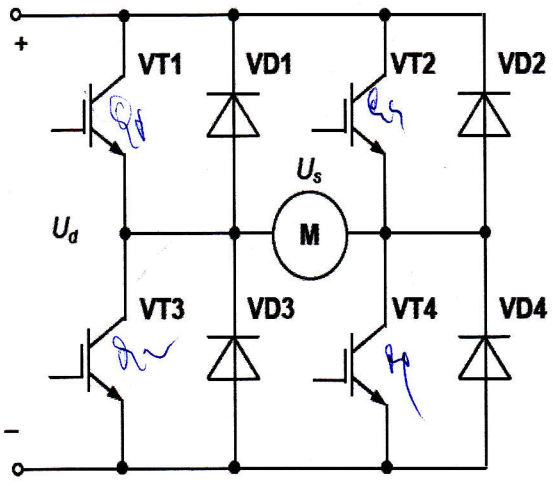
SECTION III. ATTEMPT ANY ONE (1) QUESTION.

20. Consider the circuit below and answer to the following questions :

a) Determine the type of circuit and its characteristics

b) What is the function of VD1, VD2, VD3 and VD4

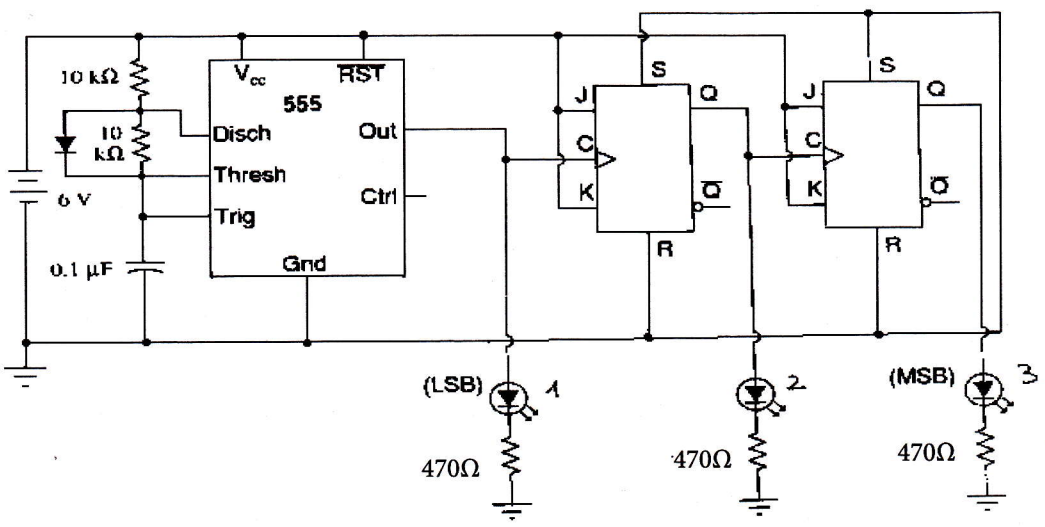
c) Explain briefly the operation of the circuit. **15marks**



21. For the following circuit,

a) Identify the main functional parts.

b) Study the behavior. **15marks**



22. Consider the statement: "Z is TRUE if at least two of W, X and Y are TRUE", otherwise Z is FALSE".

a) Write a Boolean expression for the above statement.

b) Write a truth table for the function Z;

c) Implements Z using only NOR gates. **15marks**