RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. in Information Technology
First Year - Semester I Examination – May 2022

ICT 1303 – BASIC ELECTRONICS AND DIGITAL LOGIC DESIGN

Time: Three (03) hours

- There are **SIX (06)** questions in **TWO (02)** pages.
- All questions carry equal marks.
- Answer **ANY FIVE (05)** questions.

1. a) Discuss the nature of pure semiconductors and what needs to be done to make them usable in electronic devices. (05 marks)

   b) What is a semiconductor diode? Explain what happens inside a diode when it is forward biased and reverse biased. (10 marks)

   c) "Clipping and clamping are two applications of diodes". Discuss clipping and clamping operations using suitable circuit diagrams. (05 marks)

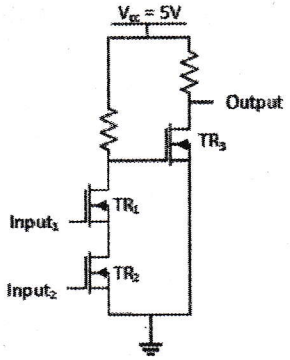
2. a) Explain how a bipolar junction transistor works. (05 marks)

   b) Briefly discuss the properties of common collector (CC) amplifiers and their applications. (05 marks)

   c) Explain why field effect transistors are classified as voltage-controlled devices. (05 marks)

   d) Discuss the differences between JFETs and MOSFETs. (05 marks)

3. a) The following circuit shows an NMOS AND gate. What is the function of TR_3 in the circuit?



(05 marks)

b) What are universal gates? Derive a NOT gate using universal gates. (05 marks)

c) Design a full adder using half-adders. (10 marks)

4. An electronic circuit is activated by four switches. One of the four switches acts as the master switch. The circuit needs to be activated when the master switch and any two other switches are switched on. Design the controller for the circuit. You are required to write down the truth table, minterms and the Boolean expression. Then minimize the expression and draw the minimal circuit. Clearly state all assumptions you made. (20 marks)

5. a) Explain the operation of a latch using gated SR latch as the example. (05 marks)

b) Discuss why it is necessary to have edge triggering in sequential circuits. (05 marks)

c) Construct a JK flip-flop using a T flip-flop. (05 marks)

d) Explain the operation of a simple shift register. (05 marks)

6. Design a modulo-10 (divide-by-10) synchronous up counter using T flip-flops. (20 marks)

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