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MPHY- 509

Digital Electronics

M.Sc. Physics (MSCPHY)

2nd Semester Examination, 2023 (June)

Time : 2 Hours]   **[Max. Marks : 35**

Note : This paper is of Thirty Five (35) marks divided into two (02) Sections A and B. Attempt the questions contained in these sections according to the detailed instructions given therein. Candidates should limit their answer to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

SECTION–A
(Long Answer Type Questions)

Note : Section 'A' contains Five (05) long answer type questions of Nine and Half (9½) marks each. Learners are required to answer any Two (02) questions only.

$(2 \times 9½ = 19)$

1. What are Universal Gates? Why are they called so? Realise AND and OR gates using NOR gates only.

2. What is difference between full & half substractor? Draw the logic diagram and truth table for a full substractor and half substractor and explain their working. How many half substractor required to make a full substractor?

3. What is a sequential circuit? Explain the operation of clocked RS flip-flop with suitable logic diagram.

4. Give a brief explanation of a Digital to Analog (D/A) Converter and the need for the D/A conversions.

5. What do you mean by multiplexer? Show that multiplexer is a universal logic device and convertable to different logic gates.

SECTION–B
(Short Answer Type Questions)

Note : Section 'B' contains Eight (08) short answer type questions of Four (04) marks each. Learners are required to answer any Four (04) questions only.   (4×4=16)

1. What is decade counter? Draw its diagram. How many stages are required for a decade counter?

2. With neat logic & timing diagrams explain the operation of a 4 - bit Serial-in/serial-out (SISO) Shift register.

3. Distinguish between combinational logic and sequential logic circuits.

4. Show how JK Flip-flop can be converted to D flip-flop.

5. Draw the EX-NOR by using the NAND gate. Explain its working with the help of truth table.

6. Discuss postulates and theorems of Boolean algebra. For the logic circuit shown below, the simplified Boolean expression for the output Y is
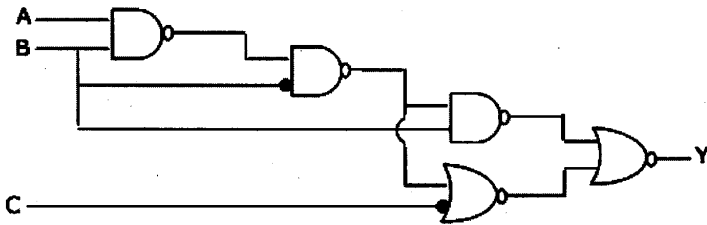
7. Writes De' Morgans theorem equations. Use De' Morgan's theorem to simplify the expression $Y = ((AB)' + A' + AB)' = 0$.

8. Given that $(456)r = (237)10$. Find r.

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