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GABA CAMPUS - ELDORET

MAIN EXAMINATION

SEPTEMBER – DECEMBER 2021 TRIMESTER

FACULTY OF SCIENCE

BACHELOR OF SCIENCE

DEPARTMENT OF COMPUTER AND INFORMATION SCIENCE

CMT 201: LOGIC CIRCUITS

Date: December 2021	Duration: 2 Hours
Instructions: Answer Question ONE and any other THREE Questions	

QUESTION ONE

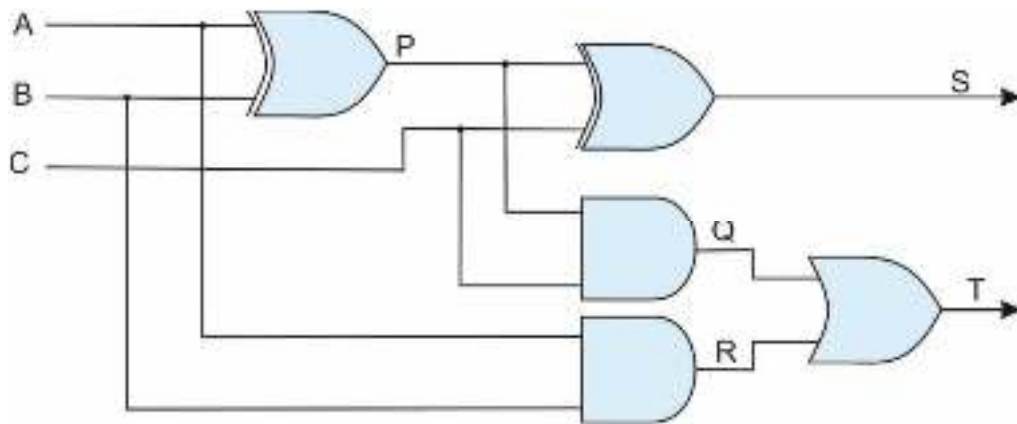
- i) Write the word TEACHER in binary. **(4 Marks)**
- ii) Explain the principal of duality in Boolean algebra. How is it useful? **(4 Marks)**
- iii) Prove following rules by the method of perfect induction. **(4 Marks)**
- a) $A\bar{B} + A.B = A$
- b) $(A+B).\overline{(A.B)} = A.\bar{B} + B.\bar{A}$
- iv) State and prove the two basic De Morgan's theorems. **(5 Marks)**
- v) Express the Boolean function $f = A + \bar{B}.C$ in sum-of-minterms (products) form. **(4 Marks)**
- vi) Describe the purpose and operation of each of the following:
- a) AND gate. **(3 Marks)**
- b) OR gate. **(3 Marks)**
- c) NOT gate. **(3 Marks)**

QUESTION TWO

- i) Why was BCD code extended to EBCDIC? **(4 Marks)**
- ii) State THREE types of combinational logic elements and THREE types of sequential logic elements. **(6 Marks)**
- iii) What is an exclusive OR gate (also called an EOR, or XOR gate)? Provide a truth table for an exclusive OR gate and explain in plain English what it does. **(10 Marks)**

QUESTION THREE

- a) For the circuit below, draw a truth table and provide the values of the output at points P, Q, R, S, and T. **(10 Marks)**



- i) Write the full form of the following abbreviations: **(8 Marks)**
- a) BCD
 - b) ASCII
 - c) EBCDIC
 - d) UTF
- ii) Differentiate between a bit and a byte? **(2 Marks)**

QUESTION FOUR

- i) Carefully discuss the sum-of-products and product-of-sums with an example **(8 Marks)**
- ii) Discuss the advantages and disadvantages of performing various arithmetic operations by additive method in a digital computer. **(8 Marks)**
- iii) Subtract 56_{10} from 92_{10} using complementary method. **(4 Marks)**

QUESTION FIVE

- i) Convert the decimal number 123 into the following bases: **(4 Marks)**
- a) binary
 - b) hexadecimal
- ii) Why is two's complement arithmetic so widely used by digital computers? **(4 Marks)**
- iii) What is the answer to the following binary addition operation? Assume that the numbers are in 8-bit signed two's complement format. **(4 Marks)**

$$\begin{array}{r} 00011101 \\ +11110011 \\ \hline \end{array}$$

- iv) Convert the two binary values in part c) and your result into decimal form and comment on the result. **(6 Marks)**
- v) State and prove Involution Law. **(2 Marks)**

END