3 (Sem–1) CSC M2

2021

(Held in 2022)

COMPUTER SCIENCE

(Major)

Paper : 1·2

(Basic Electronics)

Full Marks : 60

Time : Three hours

***The figures in the margin indicate
full marks for the questions.***

*Answer **any six** questions.*

1. Give reasons for the following :   5+5=10

    (a) The temperature coefficient of resistance of a semiconductor is negative while that of a metal is positive.

    (b) A semiconductor behaves as an insulator at 0K while it has some conductivity at room temperature.

2. (a) In a silicon p-n junction, calculate the increase in voltage across the diode if the forward current is doubled. Assume $V_T = 26\,mV$.

   (b) If the current flowing through a p-n junction diode increases ten times, what is the increase in diode voltage? Assume forward biased silicon diode operating at room temperature.

   $5+5=10$

3. Considering three logic variables A, B and C, write the fundamental properties of Boolean algebra. 10

4. (a) State and prove De Morgan's theorem.

   (b) Prove the following Boolean identities :

   (i) $AB + A\bar{B} = A$

   (ii) $A(A + B) = A$

   10

5. Find the POS and SOP forms of the following expression :

   $$X = \sum m(0, 1, 3, 6, 7, 8, 13, 15)$$

   Which one is more cost-effective ? 10

6. What is the shortcoming of an S-R flip-flop ? Explain how this shortcoming is removed in J-K flip-flop. 10

7. Write short notes on : *(any two)*

   $5\times2=10$

   (a) Phototransistor

   (b) Full adder

   (c) N-type semiconductor

   (d) Registers

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