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## **TEC-101**

## B. TECH. (FIRST SEMESTER) MID SEMESTER EXAMINATION, 2019 (ALL BRANCHES)

## **BASIC ELECTRONICS ENGINEERING**

Time:1:30 Hours

**Maximum Marks: 50** 

**Note:** (i) All questions are compulsory.

- (ii) Answer any *two* subquestions among (a), (b) and (c) in each main question.
- (iii)Total marks for each main question are **ten.**
- 1. Attempt any *two* parts of choice from (a), (b) and (c). (2x5=10 Marks)
  - (a) Distinguish conductor, semiconductor and insulator on the basis of energy band diagram and conductivity.
  - (b) A bar of pure silicon has cross-sectional area of 1 mm<sup>2</sup> and intrinsic concentration

F. No c-7 P. T. O.

(2) **TEC-101** 

of silicon is  $1.5 \times 10^{16}$  m. The free electron and hole motilities are 0.13 m /V-sec and 0.05 m /V-sec respectively. Find the conductivity and length of bar whose resistance is 50 K.

- (c) If ND and NA are donor and acceptor impurities and  $n_i$  is the intrinsic concentration, establish the relation for minority and majority charge densities.
- 2: Attempt any two parts of choice from (a), (b) and (c). (2x5=10 Marks)
  - (a) Explain formation of a p-type semiconductor from an intrinsic semiconductor by doping.
  - (b) An intrinsic semiconductor (Si) is doped with a donor type impurity such that there is one **impurity** atom on 10<sup>6</sup> atoms of **semiconductor**. If density of silicon is 5 x 10<sup>22</sup>/m<sup>3</sup> and intrinsic concentration is 2.5 x 10<sup>12</sup>/m<sup>3</sup>, the calculate **conductivity** of the doped sample if mobility of electrons is 3800 m /V-s.
  - (c) Explain diffusion current in brief.

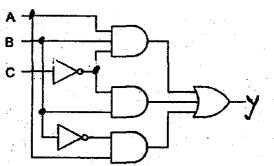
(3)

- 3. Attempt any *two* parts of choice from (a), (b) and (c). (2x5=10 Marks)
  - (a) Explain formation of depletion layer in p-n junction diode and its effect.
  - (b) A Si diode has reverse saturation current of 2.8 μA at 300 K. Find forward voltage for a forward current of 12 mA. Given that VT = 25 milivolt.
  - (e)  $(^5.73)_8 = (?)_{10} = (?)_{16} = (?)_2$ .
- 4. Attempt any *two* parts of choice from (a), (b) and (c). (2x 5=10 Marks)
  - (a) Subtract  $(11110010)_2$   $(1100111)_2$  by 2's complement method.
  - (b) Express F (A, B, C) = E m (0, 1, 2, 5) into canonical SOP and canonical POS form. Draw truth table for F.
  - (c)  $(6743)_8 + (AF9)_{16} = (?)_{16}$ .
- 5. Attempt any *two* parts of choice from. (a), (b) and (c). (2x5=10 Marks)
  - (a) State and prove **De-Morgan's** law with the 't help of truth table.
  - (b) Reduce the following expression by K-Map:

F(A, B, C, D)

= E m (0, 1, 2, 8, 10, 12, 13) + E d (3, 7, 14).

(c) Determine the output Y for the digital circuit shown in Figure and simplify it by using laws of Boolean algebra.



TEC-101 800

F. No. : c-7