

Roll No.

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^2 and intrinsic concentration

(2)

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of silicon is $1.5 \times 10^{16} \text{ m}^{-3}$. The free electron and hole motilities are $0.13 \text{ m}^2/\text{V-sec}$ and $0.05 \text{ m}^2/\text{V-sec}$ respectively. Find the conductivity and length of bar whose resistance is 50 K.

- (c) If N_D and N_A 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 10^6 atoms of semiconductor. If density of silicon is $5 \times 10^{22}/\text{m}^3$ and intrinsic concentration is $2.5 \times 10^{12}/\text{m}^3$, the calculate conductivity of the doped sample if mobility of electrons is $3800 \text{ m}^2/\text{V-s}$.
- (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 $2.8 \mu\text{A}$ at 300 K. Find forward voltage for a forward current of 12 mA . Given that $V_T = 25 \text{ millivolt}$.
- (c) $(5.73)_8 = (?)_{10} = (?)_{16} = (?)_2$.

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 $F(A, B, C) = \sum m(0, 1, 2, 5)$ 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 help of truth table.
- (b) Reduce the following expression by K-Map :
- $F(A, B, C, D)$
 $= \sum m(0, 1, 2, 8, 10, 12, 13) + \sum d(3, 7, 14)$.

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

