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Roll No.

FIFTH SEMESTER

B.Tech. [E P]

SUPPLYMENTARY EXAMINATION

(February-2019)

EP-301-Semiconductor Devices

Time : 3:00 Hours

Max. Marks: 50

Note: Answer **ANY FIVE** questions
Assume suitable missing data, if any.

1. (a). Write the postulates of classical free electron theory and derive density of states expression. Explain the significance of density of state function in semiconductors. (7)
- (b). Find drift velocity electron in a copper metal wire of cross sectional area 20 mm² carrying a current of 50 amp. Assume that each copper atom contributes two electrons for the conduction process. [Density of copper = 8.92×10^{23} Kg/m³, Atomic weight of copper = 63.5]. (3)
2. (a). Define Hall Effect and deduce an expression for carrier concentration. Write the applications of the Hall Effect. (7)
- (b) A semiconductor crystal of 10 mm long and 2 mm thick has been exposed for a magnetic field of 1 wb/m² perpendicular to the largest face. When a current of 10 mA flows through the specimen along the length wise then calculate carrier concentration in the semiconductor. [Measured Hall voltage is 37 micro volts] (3)
3. (a). Deduce the expressions for thermal equilibrium electron and hole concentrations in conduction and valance band of a semiconductor respectively. (7)
- (b). Calculate thermal equilibrium hole concentration in silicon at T=400K. (Fermi energy level is 0.27eV above the valance band and effective density of state function in valance band for silicon at T=300K is 1.04×10^{19} /cm³). (3)
4. (a). What are degenerate and nondegenerate semiconductors? Deduce the expression for thermal equilibrium electron and hole concentrations in terms of intrinsic carrier concentration. (7)
- (b). What is a compensated semiconductor? Deduce an expression for electron and hole concentrations in a compensated semiconductor. (3)

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5. (a). Compare the working conditions of Bipolar Junction Transistor (BJT) and Field Effect Transistor (FET). (7)

(b). Explain how BJT works as an amplifier. Deduce an expression for collector current in terms of amplification factor in a common base configuration. (3)

6. Write in detailed about the following (3+3 +4)

(a). Zener break down

(b). MOSFET

(c). Tunnel diode
