

B.Tech. (Main & COP)
Third Semester Examination, 2016-17
Fundamental of Electronic Devices

Time: 3 Hours**Total Marks: 100****Note: Attempt all questions; Assume missing data suitably.**

1. Attempt any two parts of the following: (10x2=20)
 - (a) Define atomic radius. Calculate atomic radii in case of s.c., f.c.c. and b.c.c. lattices.
 - (b) Define semiconductor. Differentiate between elemental and compound semiconductor. What are direct and indirect band-gap semiconductors?
 - (c) A Si diode is doped with 10^{17} As atoms/cm³. What is equilibrium hole concentration of 300⁰ K and where is E_F relative to E_i ? Derive formula used.
2. Attempt any two parts of the following: (10x2=20)
 - (a) Discuss the direct recombination of electrons and holes.
 - (b) What is meant by carrier life-time? How does direct recombination life-time differ from indirect recombination life-time?
 - (c) What is Einstein relation? Derive the formula:
$$\frac{D}{\mu} = \frac{K T}{q}$$
3. Attempt any two parts of the following: (10x2=20)
 - (a) Derive an expression for contact potential in case of a p-n junction.
 - (b) State and explain the characteristic of a zener diode. Draw the circuit diagram of voltage regulator using zener diode and explain with mathematical expression.
 - (c) Explain the operation of a full-wave rectifier. Explain and find expression of rms output voltage and voltage regulation.

4. Attempt any two parts of the following: (10x2=20)
- (a) Describe Ebers-Moll model of a transistor with mathematical expression.
 - (b) Explain why I_D in a JFET remains constant with V_{DS} in the region beyond pinch-off?
 - (c) Explain the construction, working & characteristic of MESFET.

5. Attempt any two parts of the following: (10x2=20)
- (a) What is photodiode? Explain its construction, operation and characteristics.
 - (b) Explain the construction and principle of operation of an IMPATT diode
 - (c) What is IGBT? Draw its equivalent circuit & enumerate its special features.