

B.Tech. (BTCSVI / BTECVI / BTELVI)

Term-End Examination

June, 2016

00366

BIEL-001 : BASICS OF ELECTRONICS ENGINEERING

Time : 3 hours

Maximum Marks : 70

Note : Attempt any **seven** questions. All questions carry equal marks. Use of scientific calculator is allowed.

1. What is doping of a semiconductor ? Explain how P and N-type semiconductors are formed. Also draw their energy band diagrams clearly showing the different energy levels. 10

2. (a) What are intrinsic and extrinsic semiconductors ? Comment on the conductivity of extrinsic semiconductors. 4

- (b) The resistivity of a doped silicon material is 9×10^3 ohm-m. The Hall coefficient is $3.6 \times 10^{-4} \text{ m}^3 \text{ coulomb}^{-1}$. Assuming single carrier conduction, find the mobility and density of charge carriers ($e = 1.6 \times 10^{-19}$ Coulomb). 6

3. (a) Sketch the volt – ampere characteristics of a Zener diode. Indicate the knee on the curve and explain its significance. What happens when the current in Zener decreases below the knee current ? 7
- (b) What do you mean by drift and diffusion current ? 3
4. (a) What is an ideal diode ? Sketch the characteristics of an ideal diode. 5
- (b) Explain the diffusion and depletion layer capacitance of a P-N junction. 5
5. Draw a neat sketch to illustrate the structure of N-channel JFET. Explain its principle of operation. 10
6. (a) Describe the basic principles of phototransistors. 4
- (b) Draw the circuits of the various transistor configurations. Why is common emitter configuration mostly used ? Give its typical uses. 6
7. (a) Compare PMOS and CMOS transistors. 5
- (b) Explain briefly ‘semiconductor heterojunctions’ and their transit time effect. 5

8. Why are filters used along with rectifiers in the construction of a power supply ? List the filter types used in power supplies. Explain their effect on rectifier output waveforms. 10

9. A half-wave rectifier has a load resistance of $3.5 \text{ k}\Omega$. If the diode and secondary of the transformer have a total resistance of $800 \text{ k}\Omega$ and the AC input voltage has 240 V (peak value), determine

- (a) peak, rms and average values of current through load,
- (b) DC power output,
- (c) AC power input, and
- (d) rectification efficiency. 10

10. Write short notes on any *two* of the following : $2 \times 5 = 10$

- (a) Voltage Regulator
 - (b) Varactor Diode
 - (c) Elbers-Moll Model for N-P-N Transistors
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