PAPER ID-410354

Subject Code: KEC056

Roll No: | | | | | | | | | | | | | |

# B TECH
## (SEM –V) THEORY EXAMINATION 2021-22
## ADVANCE SEMICONDUCTOR DEVICES

***Time: 3 Hours*** ***Total Marks: 100***

**Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.

### SECTION A

**1. Attempt *all* questions in brief. 2 x 10 = 20**

a. Draw the energy level diagram of a PN junction.

b. Make the energy band diagram of a metal and semiconductor junction at equilibrium.

c. Explain the Carrier-Transport Phenomena.

d. Explain the Nonvolatile Memory Devices.

e. Draw the Static Characteristics and Dynamic Characteristics of IMPATT Diode.

f. Explain the basic principle of operation of Light-Emitting Diode (LED).

g. What is Non-uniform Doping.

h. Why does current saturate in long channel MOSFET when large drain voltage is applied on drain?

i. What is kinetic energy of a hole at the top of the valence band?

j. What are the different types of degenerate Semiconductors?

### SECTION B

**2. Attempt any *three* of the following: 10 x 3 = 30**

a. Explain the recombination of excess carriers in semiconductors. Derive an expression for excess carrier lifetime.

b. Explain the working of Tunnel diode. And also explain the Resonant Tunneling Diode.

c. Differentiate between Single Electron Transistors. JFETs, MESFETs, and MODFETs.

d. Explain the working principle of photo detector. And also explain the solar cell with input output characteristics.

e. Explain the working of Charge-Coupled Device (CCD) and Quantum-Well Infrared Photodetector.

### SECTION C

**3. Attempt any *one* part of the following: 10 x 1 = 10**

(a) Derive an expression for hole and electron diffusion current.

(b) Explain n-type and p-type semiconductor with example. Define and derive the expression for minority carrier life time.

**4. Attempt any *one* part of the following: 10 x 1 = 10**

(a) Write a short note with suitable diagram: (any two)

a. Charge-Coupled Devices

b. Semiconductor laser

c. MODFETs

(b) Explain the working principle and ON/OFF operation of MESFET with characteristics

**5. Attempt any *one* part of the following: 10 x 1 = 10**

(a) The donor and acceptor concentration in Si sample is 6×1015 and 2×1015 cm–3 respectively. Determine the position of Fermi Level with respect to intrinsic energy level Ei at room temperature. Also find out the value and sign of Hall coefficient

(b) Explain the MOSFET operation in case of Depletion mode and enhancement mode device. Draw the I-V characteristic also.

**6. Attempt any *one* part of the following: 10 x 1 = 10**

(a) Discuss diffusion length, carrier life time and recombination.

(b) Discuss the phenomenon of photoconductivity in detail with its examples and applications.

**7. Attempt any *one* part of the following: 10 x 1 = 10**

(a) Explain the working principle of Photoconductor, Photodiodes, and Avalanche Photodiode.

(b) Explain the Solar Cell Sensors, Thermal Sensors and Mechanical Sensors.