Printed Pages : 2 **Roll No.** | | | | | | | | | | | **NEC014**

B. TECH.

THEORY EXAMINATION (SEM–VI) 2016-17

ADVANCE SEMICONDUCTOR DEVICES

Time : 3 Hours ***Max. Marks : 100***

Note : *Be precise in your answer. In case of numerical problem assume data wherever not provided.*

SECTION-A

1 **Attempt the following:** **(10×2=20)**

a) Energy Bands and Energy Gap
b) Optical and Thermal Properties
c) Depletion Region
d) Single Electron Transistor
e) Nonvolatile Memory Devices
f) Laser Operating Characteristics
g) Laser Physics
h) Phototransistor
i) Different types of Diodes
j) Non-uniform Doping

SECTION-B

2 **Attempt any five of the following:** **(10×5=50)**

a) What is meant by IMPATT? Explain with neat and clean diagram the BRITT DIODE.
b) Explain the working of Tunnel diode. And also explain the backward diode.
c) Draw and explain the working principle of TRAPATT diode. Calculate the avalanche zone velocity for a TRAPATT diode having $N_a = 10^{15}/cm^3$ and current density J= 8k Amp/cm^2.
d) Discuss the operation of SCR with latching and holding current in detail. Also discuss the operation, application and symbol of tunnel and zener diode.
e) Discuss the operation of N channel JFET with the condition of pinch-off. Deduce the result of transconductance of this amplifier.
f) What is graded junction? Calculate the capacitance of graded junction after assuming necessary and sufficient notation in accordance with yourself.
g) Find the maximum and normal conductivity of Si sample doped with N_A& N_D impurities after assuming necessary and sufficient notation in accordance with yourself.
h) Explain n-type and p-type semiconductor with example. Define and derive the expression for minority carrier life time.

SECTION-C

Attempt any two of the following: **(15×2=30)**

3. a. Define mobility. Also write the mass action law. Prove the Einstein relationship.
b. Explain the working principle and ON/OFF operation of MESFET with characteristics.
c. Explain rectifying contact. Also write the features of ohmic contact.

4. a. Explain the working principle of photo detector. And also explain the solar cell with input output characteristics.
b. Discuss the phenomenon of photoconductivity in detail with its examples and applications.

c. Discuss diffusion length, carrier life time and recombination.

5. Write a short note with suitable diagram:

a. Charge-Coupled Devices
b. Semiconductor laser
c. MODFETs