

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 $N_a = 10^{15}/\text{cm}^3$ and current density $J = 8\text{ k Amp/cm}^2$.
- 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.

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5. Write a short note with suitable diagram:
- Charge-Coupled Devices
 - Semiconductor laser
 - MODFETs

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