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(Following Paper ID and Roll No. to be filled in your Answer Books)

Paper ID : 131664 Roll No. | | | | | | | | | | |

B.TECH.

Theory Examination (Semester-VI) 2015-16

ADVANCE SEMICONDUCTOR DEVICES

Time : 3 Hours *Max. Marks : 100*

Section-A

1. Attempt all parts. All parts carry equal marks. Write answer of each part in short. (2×10=20)

(a) What is a space lattice ?

(b) What do you mean by effective mass of carrier ?

(c) What are energy bands ?

(d) Explain short channel effect in MOSFET's.

(e) What is TUNNETT diode ?

(f) What are power devices?

(g) Give principle of working of LED.

(h) Give advantage of solar cell over other sources of energy.

(j) Give application and example of chemical sensor.

Section-B

2. Attempt any five questions from this section. (10×5=50)

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

(ii) Distinguish between a conductor, an insulator and a semi-conductor on the basis of energy diagram.

(b) (i) Define and derive the expression for minority carrier life time.

(ii) Explain carrier transport phenomena. What is Hall effect?

(c) (i) Explain the terms phonon spectra. How direct and indirect transition involve in phonon.

(ii) Explain decay of photoexcited carrier for n-type sample.

(d) Discuss briefly the principle of operation of a GaAs MESFET. Also derive an expression for I-V characteristic of the device. Enumerate special features of MESFET's.

(e) Sketch approximate distribution of charge, electric field and electrostatic potential in the ideal MOS diode using n-type Si in inversion condition and explain them.

(f) (i) What is depletion layer capacitance? Explain its application.

(ii) Differentiate between abrupt junction and graded junction. Which technology is used commercially and why ?

(g) (i) Explain carrier distribution and current densities for forward bias and reverse bias condition in PN junction diode.

(ii) Explain the term tunnelling effect and Avalanche multiplication.

(h) (i) Explain the term varistor. How it is different from varactor?

(ii) Draw and explain energy band diagram of an ideal n-p heterojunction at equilibrium.

Section-C

Note: Attempt any two questions from this section. (15×2=30)

3. Explain degenerate semiconductors. What are their different types ? How do they differ from conventional semiconductor? What are the uses of these materials ? Explain the device operation with characteristics.

4. What is meant by IMPATT ? Describe briefly the principle of operation of IMPATT diode. Compare it with BARITT diode in terms of power, efficiency and noise behavior.

5. With suitable diagram describe the working principle of a photodiode. Explain how the various quadrants of its V-I characteristics are used in different applications ? What are charge-coupled devices ?