18PH003

Hall Ticket Number:

Y	19	ACS	428

I/IV B.Tech (Regular / Supplementary) DEGREE EXAMINATION

November, 2020 — EEE, CSE & IT

Second Semester — Semiconductor Physics and Nano Materials

Time: Three Hours — Maximum : 50 Marks

Part-A

Answer Question No.1 compulsorily. (1X10 = 10 Marks)

1. **Answer all questions**

a What is a drift current?
b Write the difference between direct band semiconductor and indirect band gap semiconductor.
c What is effective mass of an electron?
d How P-type semiconductor is formed?
e Define Fermi level.
f What is the principle of Solar cell?
g What is Kerr effect?
h What is a nano material?
i Draw the symbol of a P-N junction diode.
j Write any two assumptions of quantum free electron theory.

Part-B

Answer any Four Questions from the following: (4X10=40 Marks)

2.a	Explain the energy band theory of solids using Kronig-Penny model for the classification of electronic materials	7M
2.b	Distinguish between metals, semiconductors and insulators	3M
3.a	Derive the energy expression for quantum particle	6M
3.b	Explain the effective mass of an electron	4M
4.a	Derive the expression for carrier concentration of N-type semiconductor	6M
4.b	Explain the Fermi-Dirac distribution function and its variation with temperature.	4M
5.a	Explain the PN junction diode and its V-I characteristics.	6M
5.b	Derive the expressions for drift and diffusion currents.	4M
6.a	Explain the principle and working of Light emitting diode	5M
6.b	Define Photo voltaic effect and explain the working of a Solar cell	5M
7.a	Explain the principle and working of PIN diode	6M
7.b	Explain briefly about Faraday effect and Kerr effect	4M
8.a	Describe the preparation of nano materials by Chemical vapour deposition method	6M
8.b	Explain the properties of nano materials	4M
9.a	Explain different types of Carbon nano tubes and mention some applications of Nano materials	6M
9.b	Describe the preparation of nano materials by Sol-Gel method.	4M

$P = Kt$

$dl\ F = \frac{dP}{dt} = \frac{dK}{dt}$