Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 21141

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2022.

Second Semester

Biomedical Engineering

PH 8253 — PHYSICS FOR ELECTRONICS ENGINEERING

(Common to : Computer and Communication Engineering/Electrical and Electronics Engineering/Electronics and Communication Engineering/Electronics and Instrumentation Engineering/Electronics and Telecommunication Engineering/Instrumentation and Control Engineering/Medical Electronics)

(Regulations 2017)

Time : Three hours — Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define degenerate and non-degenerate states.
2. What is meant by effective mass?
3. The intrinsic carrier density at room temperature in Ge is $2.37 \times 10^{19}/m^3$. If the electron and hole mobilities are 0.38 and 0.18 $m^2V^{-1}s^{-1}$ respectively, calculate its resistivity.
4. Mention two differences between Zener and avalance breakdown.
5. A paramagnetic material has a magnetic field intensity of 10^4A/m. If the susceptibility of the material at room temperature is 3.7×10^{-3}, calculate the magnetization and flux density in the material.
6. Define dielectric constant.
7. Mention any two merits and demerits of solar cell.
8. What are excitons?
9. Define the term quantum well, quantum wire and quantum dot.
10. Write any two properties and applications of carbon nano tube.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive an expression for density of states. (12)

(ii) What are the merits and demerits of classical free electron theory? (2+2)

Or

(b) (i) Discuss Bloch theorem. (8)

(ii) Describe how zone theory is used to classify the solids as conductors, semiconductors and insulators. (8)

12. (a) Derive an expression for density of holes and electrons in valence band and conduction band in the case of P-type and N-type semiconductors respectively. (16)

Or

(b) (i) With a neat sketch, describe the principle, construction and working of a Schottky diode. (8)

(ii) Discuss the operation of MOS capacitor under various gate voltages. (8)

13. (a) (i) Explain the dia, para and ferro magnetic materials on the basis of spin. (12)

(ii) A magnetic material of flux density and magnetization are 0.0044 Wb/m^2 and 3300 A/m respectively. Calculate the magnetizing force and relative permeability of the material. (4)

Or

(b) What is meant by local field in dielectric and how it is calculated for a cubic structure? Deduce the Clausius-Mosotti equation. (16)

14. (a) (i) Explain the optical absorption in metals, dielectrics and semiconductors. (10)

(ii) Classify the optical materials on the basis of interaction with visible light. (6)

Or

(b) (i) Describe in detail, the principle, construction, working and applications of OLED with a neat diagram. (14)

(ii) For In laser diode, the wavelength of light emission is 1.55 μm. What is the band gap energy in eV? (2)

15. (a) Discuss in detail quantum confinement and quantum structures in nano materials. (8+8)

Or

(b) (i) Define Coulomb blockade and how it prevent unwanted tunneling. (2+2)

(ii) Describe the construction and working of single electron transistor. (12)
