

BACHELOR OF TECHNOLOGY (C.B.C.S.) (2021-COURSE)
B. Tech. Sem - I ELECTRICAL :SUMMER- 2022
SUBJECT : MODERN PHYSICS

Day : Tuesday
Date : 19-07-2022

S-24072-2022

Time : 10:00 AM-01:00 PM
Max. Marks : 60

N.B.

- 1) All questions are **COMPULSORY**.
- 2) Figures to the **RIGHT** indicate **FULL** marks.
- 3) Use of non-programmable calculator is **allowed**.
- 4) Assume suitable data **WHEREVER** necessary.
- 5) Draw neat labeled diagrams **WHEREVER** necessary.

Constants :

$$e = 1.6 \times 10^{-19} \text{C}$$
$$m_e = 9.1 \times 10^{-31} \text{kg}$$
$$h = 6.63 \times 10^{-34} \text{J-s}$$
$$m_p = 1.66 \times 10^{-27} \text{kg}$$
$$N_a = 6.025 \times 10^{23} \text{ atoms / gm-mole}$$

- Q.1** a) State and prove Gauss's law. (06)
b) Define following terms : (04)
i) Capacitor ii) Flux density iii) Magnetic lines of force iv) Electric dipole.

OR

- Q.1** Write a short note on electromagnetism. (10)
State and explain : i) Self induction ii) Mutual induction.

- Q.2** a) Explain the term dielectrics? Explain dielectric polarization. (06)
b) Explain any two applications of magnetic devices. (04)

OR

- Q.2** What is magnetism? Explain diamagnetic, paramagnetic and ferromagnetic substances. (10)

- Q.3** a) With the help of energy level diagram, explain p-n junction diode in forward biasing. (06)
b) A potential difference of 5 V is applied across the faces of a germanium plate of area 2 cm^2 and thickness of 3cm. Calculate current through the germanium plate if concentration of electron is $2 \times 10^{13} / \text{cm}^3$. (04)
[Given: $\mu_e = 3600 \text{ cm}^2 / \text{Vs}$, $\mu_h = 1800 \text{ cm}^2 / \text{Vs}$]

OR

- Q.3** State and explain fermi energy level in semiconductor. Derive the derivation for fermi energy level in intrinsic semiconductor. (10)

- Q.4** a) Define nuclear fission. Explain in detail liquid drop model of nucleus. (06)
b) Explain any two thermonuclear reactions. (04)

OR

- Q.4** With neat labelled diagram, explain principle, construction and working of power reactor. (10)

- Q.5** a) Explain with neat labelled diagram BCS theory of superconductors. (06)
b) Define : i) critical temperature ii) critical magnetic field (04)

A superconducting wire produces, a magnetic field of 10^5 A/M of certain temperature. The critical field is $1.5 \times 10^5 \text{ A/M}$ at $T = 0^0 \text{K}$. Calculate the temperature T if the critical temperature of superconductor is 9.2^0K .

OR

- Q.5** Distinguish between Type-I and Type-II superconductors and explain any three applications of superconductors. (10)

- Q.6** a) Explain principle, construction and working of semiconductor LASER. (06)
b) State and explain any two merits and demerits of fibre optics. (04)

OR

- Q.6** State Einstein's coefficients. Derive the derivation for Einstein's coefficients. (10)
