Dr Shanicite Bhardwaj 21/6/2023

M1 (5)

National Institute of Technology, Hamirpur (HP)

End Semester Examination - June, 2023

Course - B.Tech.

Semester - 2nd

Subject Code - PH-101

Subject Name -Engineering Physics

Maximum Marks: 50

All questions are compulsory

Time: 3:00Hour

Q 1:

a) What is the significance of E-K diagram? (1)

b) Draw wave function of ground state &1st excited state for electron trapped in a box. (1)

c) Comment on the role of metastable state in the operation of laser. (1)

d) Draw Fermi level for unbiased p-n junction. (1)

e) Does magnetic monopole exist? (1)

f) Write the momentum for free particle on which no external force is applied. (1)

g) Which impurities are added for p-type semiconductors. (1)

h) Which type of semiconductor materials are used for laser diode? (1)

i) Is, any wave with frequency above 20,000Hz is ultrasonic? (1)

j) What is Magnetostriction effect? (1)

Q 2: Why Semiconductors are preferred for technology? If the effective mass of an electron is equal to twice the effective mass of hole, determine the position of the Fermi level in an intrinsic semiconductor from the center of forbidden gap at room temperature. ($k=8.61*10^{-5}$eV/K). (5)

Q 3: Why we need graded index optical fiber for transmission of data? A step-index fiber is made with a core of refractive index 1.52, a diameter of 29 mm and a fractional difference index of 0.0007. It is operated at a wavelength of 1.3 mm. Find the V-number and the number of modes that the fiber will support. (5)

Q 4: How was the concept of displacement current helpful in removing discrepancy in Ampere's law? (5)

Q 5: In which medium electromagnetic waves travel with velocity of light? Show that electromagnetic waves are transverse in nature. (5)

Q 6: Illustrate principle, working and energy level diagram of Ruby Laser. Why this laser gives output in pulse form? (5)

Q 7: What is superconductivity? Explain Meissner's effect, Type-I and Type-II superconductors. (5)

Q 8: How the probability of finding the particle inside a one dimensional box changes for first three Eigen values? (5)

Q 9: What is piezoelectric effect? How it can be used for generation of ultrasonic waves? (5)