

# GYANMANJARI INNOVATIVE UNIVERSITY

## GYANMANJARI INSTITUTE OF TECHNOLOGY

B.Tech.- End Semester Examination (ESE)-Summer-2026

Enrollment No.: \_\_\_\_\_

Subject Code: BETXX10205

Subject Name: PHYSICS

Time: 10:30 AM to 01:30 PM

Date: 01-06-2026

Semester: 02

Total Marks: 100

Instructions:

1. Question No. 1 is compulsory.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

	Marks
Q.1 (a) For an intrinsic silicon, room temperature electrical conductivity is $6 \times 10^{-4} \text{ } \Omega/\text{m}$ Electron and hole mobilities are $0.25 \text{ m}^2/\text{V sec}$ and $0.045 \text{ m}^2/\text{V sec}$ respectively. Calculate the electron and hole concentration at room temp.	05
(b) Explain any one production method of ultrasonic sound waves in detail.	05
(c) Explain with diagrams of forward and reverse biasing of a p-n junction. Also plot the V-I curve for both cases	10
Q.2 (a) What is Meissner effect? obtain that magnetic susceptibility of superconductors is -1.	05
(b) Give the difference between P-type and N-type semiconductor.	05
<b>OR</b>	
(b) The electron and hole mobilities in intrinsic antimony are $6$ and $0.6 \text{ m}^2/\text{V sec}$ respectively. At room temperature, resistivity is $2 \times 10^{-4} \text{ } \Omega\text{m}$ Assuming the material is intrinsic, determine its intrinsic carrier density at room temp.	05
(c) Derive an expression for density of holes in valence band of an Intrinsic semiconductor	10
<b>OR</b>	
(c) Derive an expression for density of electrons in conduction band of an Intrinsic semiconductor	10
Q.3 (a) Explain Josephson's effect with neat and clean diagram.	05
(b) The critical temperature for a metal with isotopic mass of 198 is 4.190 K. Calculate the isotopic mass if the critical temperature falls to 4.130 K	05
(c) Explain BCS theory with neat sketch.	10
<b>OR</b>	
Q.3 (a) What is the value of critical magnetic field, if the	05

current required to destroy the magnetic field is 31.4 A, for a superconducting wire having diameter of 2 mm.

- (b) Explain the effect of isotopic mass on the critical temperature of superconductor. 05
- (c) Discuss various applications of superconductors. 10
- Q.4** (a) Calculate the frequency to which a Nickle Rod of 9.5 cm should be tuned so that it develops ultrasonic waves at fundamental node? Young's Modulus is  $2.14 \times 10^{11}$  N/m<sup>2</sup> and density of material is 7900 kg/m<sup>3</sup>. 05
- (b) Why NDT is preferred for testing of material? Explain with advantages. 05
- (c) Explain Properties of ultrasonic waves. 10
- OR**
- Q.4** (a) An ultrasonic source of 1 MHz sends down a plus towards the seabed which returns after 0.7 seconds. The velocity of sound in water is 2000 m/s. Calculate the depth of the sea. Also find the wavelength of the pulse. 05
- (b) Explain different types of ultrasonic testing. (any 2) 05
- (c) Explain different methods of detecting the presence of ultrasonic waves. 10
- Q.5** (a) Discuss the characteristics of Laser 05
- (b) Justify: Laser has unearthed many opportunities for researchers in the field of science 05
- (c) Explain Einstein's matter radiation theory and derive the relationship between Einstein's coefficients. 10
- OR**
- Q.5** (a) Laser is very useful in Defense system: Explain this statement. 05
- (b) Different application of laser 05
- (c) Explain construction, working, energy level diagram with advantages and disadvantages of He-Ne gas laser. 10