Question Paper Code: | **PH102BS**

An AUTONOMOUS Institution

ACE-R20

SEMESTER END EXAMINATION
I B. Tech- I Semester- JULY 2021
Applied Physics
(Common to ECE, CSM & CSO)

Time: 3 Hours   **Max. Marks: 70**

H. T. No

Answer any five full questions from the following. All Questions carry equal marks.
M=Marks; CO=Course Outcomes; PO= Program Outcomes

Q.No	Question	M	CO	PO
1. a)	Obtain eigen values of energy and normalized wave functions for a particle in one dimensional potential box of side 'a' and give the wave function and probability function diagrams.	8	1	1
b)	Based on band theory of solids give the classification of solids into conductors, semiconductors and insulators.	6	1	1
2. a)	Explain direct and indirect bandgap semiconductor with examples.	7	2	2
b)	Derive an expression for density of electrons in the conduction band of intrinsic semiconductor.	7	2	1
3. a)	Explain the forward and reverse baising in P-N junction diode with the help of energy level diagrams.	7	3	1
b)	Explain the construction and working of a LED. Mention it's any two applications.	7	3	1
4. a)	Discuss the variation of Fermi level on carrier concentration and temperature in p-type and n-type semiconductor.	6	2	1
b)	Explain Kronig-Penney model for electron in periodic potential and discuss its conclusions.	6	1	1
c)	Calculate the number of donor atoms per m^3 of n-type material having resistivity of 0.25 Ω-m, the mobility of electrons is 0.3 m^2/V-s.	2	2	1
5. a)	Show that for an n-type of semiconductor the Hall coefficient is $R_H = -\frac{1}{ne}$ and mention any three applications of Hall effect.	6	3	1
b)	With the help of the V-I characteristics of Zener diode discuss voltage regulation and Zener breakdown voltage.	6	2	1
c)	Calculate the de Broglie wavelength associated with an electron when it is raised to a potential of 1600 V and compare the same with that of the proton in the same potential.	2	1	
6.a)	With neat diagrams, describe the construction and working of Ruby laser. Mention two applications.	6	4	1
b)	Explain different pumping methods and essential components of a laser system.	6	4	1

c)	Calculate the wavelength emitted by GaAs laser if the energy band gap of a GaAs is 1.44 eV.	2	4	1
7.a)	Explain the different types optical fibers based on refractive index profile in detail.	6	4	1
b)	Derive an expression for the numerical aperture of an optical fiber.	6	4	1,12
c)	Calculate the acceptance angle and Numerical Aperture of a given optical fiber, if the refractive indices of core and cladding are 1.563 & 1.498 respectively.	2	4	2
8. a)	Discuss the Maxwell's equations.	5	5	1
b)	Explain Ferroelectricity and Piezoelectricity with examples. Mention the applications.	6	5	1
c)	Explain hysteresis on the basis of domain theory .	3	5	1