NAGARJUNA COLLEGE OF ENGINEERING AND TECHNOLOGY
Department of Physics

Even Semester 2023-24
Internal Assessment Test – I

Course Name: Applied Physics for CSE stream and Applied Physics for EC	**Course Code:** 23PHYS22/23PHYE22	**Semester:** II
Date: 25-04-2024	**Time: 09:30am to 10:30am**	**Max. Marks: 25**

Physical constants: Planck's constant, $h = 6.63\times10^{-34}$ J.s, Speed of light, $c = 3\times10^{8}$ ms^{-1}, Mass of electron, $m = 9.1 \times 10^{-31}$ kg, Charge of electron, $e = 1.6\times10^{-19}$C, Boltzmann's constant, $k=1.38 \times 10^{-23}$J/K.

[Note: Answer any THREE full questions as indicated below]

Sl. No		QUESTIONS	COs	RBT Levels	Marks
1.	a)	With the help of neat diagrams explain the construction and working of the Nd-YAG Laser.	CO2	L2	07M
	b)	The ground state and the first excited state of Ruby are separated by 1.8 eV. Calculate the ratio of the number of atoms in the excited state to that in the ground state at 300K.	CO3	L3	03M
OR					
2.	a)	Describe the point-to-point communication using optical fibers.	CO2	L2	07M
	b)	Determine the attenuation in an optical fiber of length of 500m, when light signal of power 100mW emerges out of fiber with power of 90mW.	CO3	L3	03M
3.	a)	Setup the time independent one-dimensional Schrödinger wave equation.	CO2	L2	07M
	b)	Calculate de Broglie wavelength associated with 0.3kg cricket ball at a speed of 120km/hr.	CO3	L3	03M
OR					
4.	a)	Using HUP, show that an electron cannot exist inside the nucleus.	CO2	L2	07M
	b)	An electron is bound in 1D potential well of width of 0.19nm. Determine its energy values in the 2^{nd} and 3^{rd} excited states.	CO3	L3	03M
5.		Define wave-particle dualism and de Broglie hypothesis.	CO1	L1	05M
OR					
6.		List any 5 advantages of optical fiber communication system.	CO1	L1	05M

College of Engineering & Technology

NAGARJUNA COLLEGE OF ENGINEERING AND TECHNOLOGY
Department of Physics

Even Semester 2023-24
Internal Assessment Test – II

Course Name: Applied Physics for CSE Stream/ECE	**Course Code**: 23PHYS22 23PHYE22	**Semester**: II
Date: 12-06-2024	**Time: 9.30 am- 10.30 am**	**Max. Marks: 25**

Physical constants: Planck's constant, $h = 6.63\times10^{-34}$ J.s, Speed of light, $c = 3\times10^{8}$ ms^{-1},
Mass of electron, $m = 9.1 \times 10^{-31}$ kg, Charge of electron, $e = 1.6\times10^{-19}$C,
Boltzmann's constant, $k=1.38 \times 10^{-23}$J/K.

[Note: Answer any THREE full questions as indicated below]

Sl. No		QUESTIONS	COs	RBT Levels	Marks
1.	a)	Starting from Hooke's law, derive the differential equation of motion for SHM. Mention and explain the solution to the differential equation.	CO2	L2	07M
	b)	The distance between two pressure sensors in a shock tube is 100 mm. the time taken by the shock wave to travel this distance is 200 μsec. If the velocity of sound under the same conditions is 340 m/s, Calculate the Mach number of shock wave.	CO3	L3	03M
		OR			
2.	a)	With the help of a schematic diagram, explain the construction and working of Reddy shock tube.	CO2	L2	07M
	b)	A spring of force constant 62.57 N/m is suspended with a mass 1.5 kg downwards. Consider that the spring is executing damping simple harmonic oscillations with damping coefficient of 7 kg/s. Identify whether it is the case of under damping or of over damping.	CO3	L3	03M
3.	a)	Derive an expression for electrical conductivity in metals.	CO2	L2	07M
	b)	Lead has a superconducting transition temperature of 7.26 K. If initial field at 0 K is 50×10^{3} Tesla, calculate the critical field at 6 K.	CO3	L3	03M
		OR			
4.	a)	Explain Type-I and Type-II superconductors.	CO2	L2	07M
	b)	Calculate the relaxation time of electrons in a metal of electrical resistivity 1.43×10^{-8} Ohm-m and having the electron density 6.5×10^{28} per cubic meter.	CO3	L3	03M
5.		List any five applications of shock waves.	CO1	L1	05M
		OR			
6.		Write a short note on SQUID.	CO1	L1	05M

Nagarjuna College of Engineering & Technology

(Autonomous Institute Affiliated to VTU)

First/Second Semester BE Degree SE Examination, July 2024

Applied Physics for CSE stream

Time: 3Hrs. Max. Marks: 100

Note: Answer any one full questions from each module

Planck's constant, $h = 6.63\times10^{-34}$ Js, Speed of light, $c = 3\times10^{8}$ ms^{-1}, Mass of electron, $m = 9.1 \times 10^{-31}$ kg, Acceleration due to gravity, $g = 9.8$ m/s^2, Charge of electron, $e = 1.6\times10^{-19}$ C, Boltzmann's constant, $k = 1.38 \times 10^{-23}$ J/K

		COs	M	BL
	Module – 1			
1a	Explain point to point communication system using optical fibers with a neat block diagram.	CO2	8	L2
b	Obtain an expression for energy density of radiation under thermal equilibrium condition in terms of Einstein coefficients.	CO2	8	L2
c	The refractive indices of core and cladding are 1.56 and 1.52, respectively in an optical fiber. Calculate the numerical aperture and angle of acceptance of an optical fiber.	CO5	4	L3
	OR			
2a	Based on geometry, refractive index profile and ray propagation, explain different types of optical fibers. Mention any two factors contributing for attenuation.	CO2	8	L2
b	Explain the construction and working of Nd-YAG laser.	CO2	8	L2
c	Calculate the ratio of population of two energy states in a medium in thermal equilibrium, if the wavelength of the emitted light is 510.6 nm at 330 K.	CO5	4	L3
	Module – 2			
3a	Explain wave function, probability density, normalization and zero point energy.	CO2	8	L2
b	Based on Heisenberg's uncertainty principle, show that electrons cannot exist in side the nucleus of an atom.	CO2	8	L2
c	Calculate the wavelength associated with an electron raised through a potential difference of 1800 V.	CO3	4	L3
	OR			
4a	Explain de Broglie hypothesis. Obtain de Broglie wavelength of an electron accelerated by a potential V.	CO2	8	L2
b	Derive one dimensional time independent Schrödinger wave equation.	CO2	8	L2
c	Compute the first two permitted state energy of an electron which is bound in a box of width 2 Å.	CO3	4	L3
	Module – 3			
5a	Explain any four properties and applications of shock waves.	CO2	8	L2
b	Derive the equation of motion and its solution for the damped oscillation.	CO2	8	L2
c	The distance between two pressure sensors in a shock tube is 120 mm. The time taken by the shock wave to travel this distance is 240 μs. If the velocity of sound under the same conditions is 340 m/s, calculate the Mach number of the shock wave.	CO3	4	L3
	OR			
6a	Obtain the expression for simple harmonic motion and mention its solution. Mention any two examples of simple harmonic motion.	CO2	8	L2
b	Explain the construction and working of Reddy shock tube with a neat diagram.	CO2	8	L2
c	Calculate the resonance frequency of a spring of force constant 2467 N/m, carrying a mass of 100 gm.	CO3	4	L3
	Module – 4			
7a	Explain type-1 and type II superconductors with neat diagrams.	CO2	8	L2
b	Based on the principle of Meissner effect, explain the construction and working of Maglev vehicle.	CO4	8	L2
c	Calculate the relaxation time of conduction electrons in a metal of resistivity 1.54×10^{-8}	CO3	4	L3

ohm-m, if the metal has 5.8×10^{28} conduction electrons per m^3.

OR

8a	Derive the expression for electrical conductivity of metals based on classical free electron theory.	CO2	8	L2
b	With neat diagram explain the structure and working of DC and RF SQUID.	CO4	8	L2
c	Superconducting tin has a critical temperature of 3.7 K at magnetic field and a critical field of 0.0306 T. Calculate the critical field at 4 K.	CO3	4	L3

Module – 5

9a	Write the differences between classical computing and quantum computing.	CO1	8	L1
b	Explain Quantum NOT gate and Pauli Y gate with matrix representation and truth table.	CO2	8	L2
c	Given $A=\begin{bmatrix} 0 & i \\ -i & 0 \end{bmatrix}$ then prove that $A^{\dagger}=A$.	CO3	4	L3

OR

10a	Write the properties of qubit. Explain the representation of qubit on Bloch sphere.	CO1	8	L1
b	Explain Pauli's Matrices and apply Pauli's matrices on the states $\|0\rangle$ and $\|1\rangle$	CO2	8	L2
c	Show that the matrix $U=\frac{1}{\sqrt{2}}\begin{bmatrix} 1 & 1 \\ i & -i \end{bmatrix}$ is Unitary.	CO3	4	L3