CBCS SCHEME

USN | | | | | | | | | | |

BPHYS102/202

First/Second Semester B.E./B.Tech. Degree Supplementary Examination, June/July 2024

Applied Physics for CSE Stream

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Obtain the expression for energy density using Einstein's coefficients of absorption and emission.	08	L2	CO1
	b.	Define angle of acceptance. Explain types of optical fibres with neat ray diagram and refractive index profile.	07	L2	CO1
	c.	Find the ratio of population of the two states in a He-Ne laser that produce light of wavelength 6328 A° at 27°C.	05	L3	CO1
		OR			
Q.2	a.	Derive an expression for numerical aperture of an optical fibre in terms of fraction of RI.	08	L2	CO1
	b.	What is active medium? Explain construction and working of semiconductor laser.	07	L2	CO1
	c.	For a 30 cm long fiber attenuation 0.8 dB/km, find the output power if a 200 μW power is launched?	05	L3	CO1
		Module – 2			
Q.3	a.	Define graph velocity, phase velocity, wave function and probability density.	08	L2	CO2
	b.	Derive time-independent Schrödinger wave equation.	07	L2	CO2
	c.	Which has shorter wavelength, a 10 eV photon or a 10 eV electron? Explain.	05	L2	CO2
		OR			
Q.4	a.	State and explain Heisenberg's uncertainty principle. Explain principle of complimentarity.	07	L2	CO2
	b.	Derive the wave function of a particle inside infinite potential well of width 'a' using normalization condition.	08	L2	CO2
	c.	Compute the energy of the lowest three levels for an electron in a square well of width 3 A°.	05	L3	CO2
		Module – 3			
Q.5	a.	What is Block Sphere? Represent | 0 > and |1 > on the Bloch sphere.	08	L2	CO1
	b.	Explain probability, normalization and quantum superposition.	07	L2	CO1
	c.	Using two X-gates in series, show that two not gates in series are equivalent to a quantum wire.	05	L2	CO1
		OR			
Q.6	a.	Discuss two qubit quantum NOT gate or controlled NOT gate with four different input states.	08	L2	CO3
	b.	State Moore's law. Show that S gate can be formed by connecting two T gates in series.	07	L3	CO3
	c.	Find the inner product basis of states | 1 > and | 0 >, and draw conclusions on the result.	05	L3	CO3

Module – 4					
Q.7	**a.**	State Mathiessen's rule. Discuss variation of Fermi factor with temperature and energy.	**08**	**L2**	**CO4**
	b.	Define critical field. Write a note on high temperature super conductors.	**07**	**L1**	**CO4**
	c.	In a solid, consider the energy level lying 0.01 eV below the fermilevel. What is the probability of this level not being occupied by an electron?	**05**	**L3**	**CO4**
OR					
Q.8	**a.**	Define super conductors. Give brief account on BCS theory of super conductors.	**08**	**L2**	**CO4**
	b.	What is density of states? Explain failures of classical free electron theory.	**07**	**L2**	**CO4**
	c.	Find the transition temperature of a metal whose critical magnetic field is 5×10^3 A/m at 6 K and 2×10^4 A/m at 0 K.	**05**	**L3**	**CO4**
Module – 5					
Q.9	**a.**	What are frames and frames per seconds? Explain how the odd rule can be applied to place the object in specific frames.	**08**	**L2**	**CO5**
	b.	Explain Monte-Carlo method applied to approximating the value of x.	**07**	**L2**	**CO5**
	c.	While animating a speeding up car the total distance travelled over 6 frames is 25 m, calculate the basic distance.	**05**	**L2**	**CO5**
OR					
Q.10	**a.**	Define jump magnification. Explain how to calculate jump timing.	**07**	**L2**	**CO5**
	b.	Explain Poisson and normal distribution with their probability functions.	**08**	**L2**	**CO5**
	c.	The number of particles emitted per second by a random radioactive source has a Poison distribution with $\alpha = 4$. Calculate the probability of $P(x = 0)$, $P(x = 1)$ and $P(x = 2)$.	**05**	**L3**	**CO5**

* * * * *