165

MAHARAJA INSTITUTE OF TECHNOLOGY
MYSORE
Department of Physics
1st Internal Assessment
First semester

Subject Name: Applied Physics for CSE stream
Subject code: BPHYS102
Time: 02:15 PM - 03:30 PM
Total Marks: 30
Faculty: Dr. Vijaylakshmi Dayal
Lokesh N, Shamantha M S, Sahana A R

Answer any one full question
(CS Stream- J, K, L, M, N Section)

Q		Question Description	Marks	BTL	CO
1	A	Demonstrate a semiconductor laser with its construction and operation using the energy level diagram.	7	L3	2
	B	Compute a numerical aperture expression using the core, cladding, and surrounding refractive indices.	5	L3	2
	C	A Laser has a power output of 10^{-3} watt. Calculate the number of photons emitted per second by the laser given the wavelength of the laser is 692.8 nm.	3	L3	2
		OR			
2	A	Using a modest diagram, describe the three different types of optical fibre rendering to their modes of propagation.	7	L3	2
	B	Write a brief note on how the laser cooling system and bar code reader operate.	5	L3	2
	C	Calculate the attenuation coefficient of the given optical fiber of length 1500 m given the input and output power are 100 mW and 70 mW respectively.	3	L3	2
		AND			
3	A	Using the time-independent Schrodinger wave equation, show that in the bound state, the energy value of a particle is discrete and quantized,	7	L3	2
	B	Discuss about Wave function and its physical significance in explaining the Matter waves.	5	L3	2
	C	Find the De Broglie wavelength of a proton whose energy is 3eV. Given the mass of proton = 1.67×10^{-27} kg.	3	L3	2
		OR			
4	A	Establish a one-dimensional time-independent Schrodinger wave equation.	7	L3	2
	B	Summarize Heisenberg's uncertainty principle and demonstrate that electrons do not exist within the nucleus.	5	L3	2
	C	The position and momentum of 2 keV electrons are simultaneously determined. If its position is located within 2 A^0, find the uncertainty in the determination of its momentum.	3	L3	2

165

MAHARAJA INSTITUTE OF TECHNOLOGY
MYSORE
Department of Physics
2nd Internal Assessment
First semester

Subject Name: Applied Physics for CSE
Subject code: BPHYS102
Time: 02:15 PM-03:30 PM
Total Marks : 30
Faculty: Dr.Vijaylakshmi Dayal
Lokesh N, Shamantha M S

Answer two full questions
(CSE Stream- J, K, L, M and N Section)

Q		Question Description	Marks	BTL	CO
1	A	Visualize the Qubit state $\|\psi>$ on a 3D Bloch sphere by determining the appropriate polar angle (θ) and azimuthal angle (φ).	10	L4	3
	B	iii. Verify that the states; $\|\phi1>$, $\|\phi2>$, & $\|\phi3>$, are orthonormal, where $\|\phi1> = \frac{1}{\sqrt{2}}\begin{pmatrix}-1\\0\\1\end{pmatrix}$, $\|\phi2> = \frac{1}{2}\begin{pmatrix}1\\\sqrt{2}\\1\end{pmatrix}$, $\|\phi3> = \frac{1}{2}\begin{pmatrix}1\\-\sqrt{2}\\1\end{pmatrix}$. iv. Find the probability that we find in the qubit in the state $\|0>$ and $\|1>$ $\|\psi> = \frac{1}{\sqrt{3}}\|0> + \sqrt{\frac{2}{3}}\|1>$, and $\|\psi> = \frac{i}{2}\|0> + \frac{\sqrt{3}}{2}\|1>$	10	L4	3
		OR			
2	A	Describe the working of controlled-NOT gate and Toffoli Gate mentioning its matrix representation, Circuit symbol and truth table.	10	L4	3
	B	iii. Explain the T-gate and also Show that the T- gate is unitary. iv. Consider the following two kets $\|\psi> = \begin{pmatrix}-1+i\\3\\2+3i\end{pmatrix}$ and $\|\phi> = \begin{pmatrix}6\\i\\5\end{pmatrix}$. Also find; $\|\psi>^*$ And $\|\phi>^*$ and, say if, $\|\psi>$ and $\|\phi>$ are orthogonal.	10	L4	3
		AND			
3	A	Describe Fermi factor. Distinguish Fermi factor based on the variation of Fermi factor with temperature.	7	L3	2
	B	Calculate the probability electron occupying an energy level 0.02 eV above Fermi level at 350 K.	3	L3	2
		OR			
4	A	Distinguish the Failures of Classical free electron theory.	7	L3	2
	B	Calculate the probability electron occupying an energy level 0.02 eV below Fermi level at 300 K.	3	L3	2

MAHARAJA INSTITUTE OFTECHNOLOGY
MYSORE
Department of Physics
3rd Internal Assessment
First Semester

Subject Name: Applied Physics for CSE
Subject code: BPHYS102
Time: 02:15 – 03:00 PM
Total Marks: 30
Faculty: Dr. Vijaylakshmi Dayal
Lokesh N, Shamantha M S, Sahana A R

Answer any two full questions
(K,L, M and N Section)

Q		Question Description	Marks	BTL	CO
1	A	Based on DC Josephson effect explains construction and working of DC SQUID with neat diagram.	7	L4	3
	B	The Critical temperature of Nb is 9.15 K. At 0K, the critical field is 0.196T.Calculate Critical Field at 7K.	3	L3	2
OR					
2	A	With neat diagram depending on the critical magnetic field categorize Superconductors and explain. (Type I And Type II).	7	L4	3
	B	The Critical field for Niobium is $1.2 \times 10^5\ A/m$ at 8 K and $2.3 \times 10^5 A/m$ at 0K. Find the transition temperature of the element.	3	L3	2

		AND			
3	A	Describe Jumping and explain the different parts of jump with suitable example.	**7**	**L3**	**2**
	B	Analyze the Modeling probability for proton decay. The number of particles emitted randomly by a radioactive sample obeys Poisson distribution with $\lambda = 4$. Calculate p(x=0), P (x =1), P(x =2),P(X=3)	**10**	**L4**	**3**
	C	While animating speeding up car animation, the total distance covered over 7 frames is 0.18m. Calculate the base distance by using Odd rule Multipliers.	**3**	**L3**	**2**
		OR			
4	A	Describe the general pattern of Monte Carlo method and hence estimate the value of Pi	**7**	**L3**	**2**
	B	Categorize the Linear motion timing, Uniform motion timing, slow in and slow out motion with a neat diagram. Given the base distance is 2m for the slow in motion. So find the distance covered between frames 3^{rd} and 4^{th}, 1^{st} and 5^{th} frame.	**10**	**L4**	**3**
	C	In the case of Jump action, push height is 0.6m and Jump magnification is 5. Calculate the jump height, push acceleration. Acceleration due to gravity = 9.8 m/s^2.	**3**	**L3**	**2**