K.S. INSTITUTE OF TECHNOLOGY, BENGALURU - 560109
SECOND INTERNAL TEST QUESTION PAPER 2023-24 ODD SEMESTER

SET: A

USN | | | | | | | | | |

Degree	:	B.E	**Semester**	:	I
Branch – Stream	:	CSE, CSD, AI&ML- CSE STREAM	**Course Type / Code**	:	Integrated/BPHYS102
Course Title	:	APPLIED PHYSICS FOR CSE-Stream	**Date**	:	26/12/2023
Duration	:	**1 ½ Hr (90 minutes)**	**Max Marks**	:	50

Note: Answer **ONE full** question from each module.

K-Levels: K1-Remebering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating, K6-Creating

Q No.	Questions	Marks	CO	K-Level
	Module 3			
1(a)	**Explain** Orthogonality and Orthonormality with an example for each.	5	CO3	K2
(b)	**Make use of** qubits, when Given $\|\psi\rangle = \begin{pmatrix}\alpha_1\\ \alpha_2\end{pmatrix}$ and $\|\phi\rangle = \begin{pmatrix}\beta_1\\ \beta_2\end{pmatrix}$ Prove that $\langle\psi\|\phi\rangle = \langle\phi\|\psi\rangle^*$	5	CO3	K3
	OR			
2(a)	**Explain** the working of phase gate mentioning its matrix representation and truth table.	5	CO3	K2
(b)	**Make use of** qubits and find the matrix representation of 'X'. A Linear Operator 'X' operates such that X $\|0\rangle = \|1\rangle$ and X $\|1\rangle = \|0\rangle$.	5	CO3	K3
	Module 4			
3(a)	**Explain** the failures of classical free electron theory and assumptions of quantum free electron theory of metals.	8	CO4	K2
(b)	**Explain** Meissner's Effect and the variation of critical field with temperature.	8	CO4	K2
(c)	**Make use of** critical field equation and find the critical field at 2K when a superconducting tin has a critical temperature of 3.7 K at zero magnetic field and a critical field of 0.0306 Tesla at 0 K.	4	CO4	K3
	OR			
4(a)	**Explain** the phenomenon of superconductivity and discuss qualitatively the BCS theory of superconductivity for negligible resistance of metal at temperatures close to absolute zero.	8	CO4	K2
(b)	**Explain** RF Squid with the help of a neat sketch.	8	CO4	K2
(c)	**Make use of** fermi factor and find the temperature at which there is 1% probability that a state with an energy 0.5 eV above Fermi energy is occupied.	4	CO4	K3
	Module 5			
5(a)	**Explain** the importance of size & scale and weight and strength in animations.	8	CO5	K2
(b)	**Explain** the general pattern of monte Carlo method and hence determine the value of π.	8	CO5	K2
(c)	**Make use of** poisons model calculate the probability at K=0,1,2, for a volcanic eruption occurred once in 100 years.	4	CO5	K3
	OR			
6(a)	**Explain** modeling the probability for proton decay	8	CO5	K2
(b)	**Explain** timing in linear motion, slow-in and slow-out	8	CO5	K2
(c)	**Make use of** odd rule multiplier, calculate the base distance and the number of frames in sequence when a slowing-in object in an animation has a first frame distance 0.5m and the first slow in frame 0.35m.	4	CO5	K3

Dr Renuka
Name & Signature of Course In charge:

Dr. Renuka
Name & Signature of Module Coordinator:

HOD

Principal

K.S. INSTITUTE OF TECHNOLOGY, BANGALORE - 560109
SECOND INTERNAL TEST 2023 – 24 ODD SEMESTER

SET- A

SCHEME AND SOLUTION

Degree : BE
Branch - stream : CSE, CSD, AL&ML
Course Title : APPLIED PHYSICS FOR CSE

Semester : I
Course Type / Code : INTERGRATED
Max Marks : 50

Q.NO.	POINTS	MARKS
1 a	Orthogonality and Orthonormality conditions	2
	examples	3
1 b	$\langle\psi\|\phi\rangle=(\alpha_1^*\alpha_2^*)\begin{pmatrix}\beta_1\\\beta_2\end{pmatrix}=\beta_1\alpha_1^*+\beta_2\alpha_2^*$	2.5
	$\langle\psi\|\phi\rangle^* =\beta_1^*\alpha_1+\beta_2^*\alpha_2$	2.5
2 a	Phase gate s=$\begin{pmatrix}1&0\\0&i\end{pmatrix}$ truth table	2.5, 2.5
2 b	Let X=$\begin{pmatrix}x_{11}&x_{12}\\x_{21}&x_{22}\end{pmatrix}$, operating on $0\rangle$ and $1\rangle$, we find, X=$\begin{bmatrix}0&1\\1&0\end{bmatrix}$	2.5, 2.5
3a	Failures of CFET, assumptions of QFET	4,4
3 b	Meissner's effect, graph and explanation	5,3
3 c	$H_c = H_0\left[1-\left(\frac{T}{T_c}\right)^2\right]$, substitution , $H_c = 0.0216$	1,3
4 a	phenomenon of superconductivity and discuss qualitatively the BCS theory	2,6
4 b	Define SQUID and explanation of RF squid with diagram.	2,3,3
4 c	$f(E)=\frac{1}{e^{\left(\frac{E-E_f}{KT}\right)}+1}$, substitution, T=1261.1K	1,3
5 a	importance of size & scale and weight and strength in animations	4,4
5 b	general pattern of monte Carlo method and hence determine the value of π.	4,4
5 c	$\lambda=1, f(k,\lambda)=P(X=K)=\frac{\lambda^K e^{-\lambda}}{K!}$, P(K=0)=0.36, P(K=1)=0.368, P(K=2)= 0.184	2,2
6 a	probability for proton decay	8
6 b	Timing in linear motion, slow-in and slow-out	4,4
6 c	Base distance=$\frac{Distance\ between\ adjacent\ distances}{2}$, = 0.075, No of frames= 0.5/0.075=7 frames.	2,2

Course In-charge Module Coordinator HOD

K.S. INSTITUTE OF TECHNOLOGY, BENGALURU - 560109
SECOND INTERNAL TEST QUESTION PAPER 2023-24 ODD SEMESTER

SET: B

USN | | | | | | | | | |

Degree	:	B.E	Semester	:	I
Branch - Stream	:	CSE, CSD, AI&ML - CSE STREAM	Course Type / Code	:	Integrated/BPHYS102
Course Title	:	APPLIED PHYSICS FOR CSE-Stream	Date	:	26/12/2023
Duration	:	1 ½ Hr (90 minutes)	Max Marks	:	50

Note: Answer **ONE full** question from each module.

K-Levels: K1-Remebering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating, K6-Creating

Q No.	Questions	Marks	CO	K-Level
	Module 3			
1(a)	**Explain** the working of controlled Z – gate mentioning its matrix representation and truth table.	5	CO3	K2
(b)	**Make use of** qubits when Given $\|\psi\rangle = \begin{pmatrix}\alpha_1\\ \alpha_2\end{pmatrix}$ and $\|\phi\rangle = \begin{pmatrix}\beta_1\\ \beta_2\end{pmatrix}$ Prove that $\langle\psi\|\phi\rangle = \langle\phi\|\psi\rangle^*$	5	CO3	K3
	OR			
2(a)	**Explain** the CNOT gate and its operation on four different input states.	5	CO3	K2
(b)	**Make use of** qubits and find the matrix representation of 'X'. A Linear Operator 'X' operates such that X $\|0\rangle = \|1\rangle$ and X $\|1\rangle = \|0\rangle$.	5	CO3	K3
	Module 4			
3(a)	**Define** Fermi energy and **explain** the variation of fermi factor with temperature and energy.	8	CO4	K2
(b)	**Explain** DC and AC Josephson effects and mention the applications of superconductivity in quantum computing.	8	CO4	K2
(c)	**Make use of** fermi factor and calculate the probability of an electron occupying an energy level 0.02eV above the fermi level at 200K and 400K in a material.	4	CO4	K3
	OR			
4(a)	**Explain** DC Squid with the help of a neat sketch.	8	CO4	K2
(b)	**Explain** Meisner's effect and hence classify superconductors into soft and hard superconductors using M-H graphs.	8	CO4	K2
(c)	**Make use of** critical field equation and find the critical field of lead at 6K that is having a transition temperature of 7.26K, If the initial field at 0K is $50\times10^3 Am^{-1}$.	4	CO4	K3
	Module 5			
5(a)	**Explain** timing in Linear motion, Uniform motion, slow in and slow out.	8	CO5	K2
(b)	**Explain** the odd rule and odd rule multipliers with a suitable example.	8	CO5	K2
(c)	**Make use of** odd rule multiplier and calculate the distance between the frames when the base distance is 0.5 cm for the slow –out, (a) #4 and #5 (b) #1 and #7.	4	CO5	K3
	OR			
6(a)	**Expalin** Jumping and parts of jumping.	8	CO5	K2
(b)	**Explain** the salient features of Normal distribution using bell curves.	8	CO5	K2
(c)	**Make use of** odd rule multiplier, calculate the base distance and the number of frames in sequence when a slowing-in object in an animation has a first frame distance 0.5m and the first slow in frame 0.35m.	4	CO5	K3

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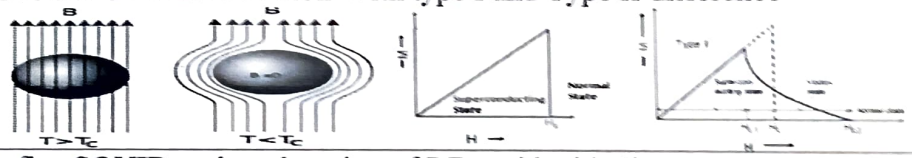
K.S. INSTITUTE OF TECHNOLOGY, BANGALORE - 560109
SECOND INTERNAL TEST 2023 – 24 ODD SEMESTER

SET- B

SCHEME AND SOLUTION

Degree : BE | **Semester : I**
Branch - stream : CSE, CSD, AL&ML | **Course Type / Code : INTERGRATED**
Course Title : APPLIED PHYSICS FOR CSE | **Max Marks : 50**

Q.NO.	POINTS	MARKS
1 a	Controlled Z gate truth table	2,3
1 b	$\langle\psi\|\phi\rangle=(\alpha_1^*\alpha_2^*)\begin{pmatrix}\beta_1\\\beta_2\end{pmatrix}=\beta_1\alpha_1^*+\beta_2\alpha_2^*$	2.5
	$\langle\psi\|\phi\rangle^* =\beta_1^*\alpha_1+\beta_2^*\alpha_2$	2.5
2 a	CNOT gate and truth table	2.5, 2.5
2 b	Let X=$\begin{pmatrix}x_{11} & x_{12}\\x_{21} & x_{22}\end{pmatrix}$, operating on 0⟩ and 1⟩, we find, X=$\begin{bmatrix}0 & 1\\1 & 0\end{bmatrix}$	2.5, 2.5
3a	Fermi energy, Fermi factor f(E) , three cases ; (i) E< E_f, E > E_f at T=0K and normal temperature	2, 5, 1
3 b	Josephson effect, Ac and DC effect and application as charge qubit, Phase qubit and Flux qubit.	2,2,2,2
3 c	RF squid explanation and diagram	6,2
4 a	Meissner's effect definition with type I and Type II difference 	2,6
4 b	Define SQUID and explanation of RF squid with diagram.	2,3,3
4 c	$H_c = H_0\left[1-\left(\frac{T}{T_c}\right)^2\right]$, substitution , H_c	1,3
5 a	importance of timing in Linear motion, Uniform motion, slow in and slow out.	4,4
5 b	odd rule and odd rule multipliers with a suitable example	2,4,2
5 c	$\lambda = 1, f(k,\lambda) = P(X=K) = \frac{\lambda^K e^{-\lambda}}{K!}$, P(K=0)=0.36, P(K=1)=0.368, P(K=2)= 0.184	2,2
6 a	probability for proton decay	8
6 b	Timing in linear motion, slow-in and slow-out	4,4
6 c	Base distance=$\frac{Distance\ between\ adjacent\ distances}{2}$, = 0.075, No of frames= 0.5/0.075=7 frames.	2,2

Course In-charge **Module Coordinator** **HOD**