Zagdu Singh Charitable Trust's (Regd.)
THAKUR COLLEGE OF ENGINEERING & TECHNOLOGY
Autonomous College Affiliated to University of Mumbai
Approved by All India Council for Technical Education(AICTE) and Government of Maharashtra(GoM)
Conferred Autonomous Status by University Grants Commission (UGC) for 10 years w.e.f. A.Y 2019-20
Amongst Top 200 Colleges in the Country, Ranked 195th in NIRF India Ranking 2019 in Engineering College category
• ISO 9001:2015 Certified • Programmes Accredited by National Board of Accreditation (NBA), New Delhi
• Institute Accredited by National Assessment and Accreditation Council (NAAC), Bangalore
Estd. in 2001
Website : www.tcetmumbai.in

IN-SEMESTER ASSESSMENT (ISE-I) DECEMBER 2022
FE / FT (Semester-I) CBCGS-HME 2020
PHYSICS

Branch: CIVIL, COMP, CS&E, E&CS, IoT, AI&DS
Div: A, B & C
Duration: 60 Minutes
Instructions –

Date : 27/12/2022
Timing: 1:30 PM to 2:30 PM
Maximum Marks: 20

1. All questions are compulsory.
2. Assume suitable data wherever necessary and state the assumptions made.
3. Diagrams / sketches should be given wherever necessary.
4. Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5. Figures to the right indicate full marks.

$\rho = \frac{1}{\sigma}$

$\sigma = \mu e n$ $\quad \mu = \frac{1}{\rho e n}$

Q.1		Solve any 5 Questions.	Marks
	a.	The resistivity of Cu is 2.36×10^{-8} ohm-m. Calculate the mobility of electron in Cu. Given, the no. of electrons per unit volume is $12.98 \times 10^{28}/m^3$.	02
	b.	In a semiconductor with hall coefficient 145 cc/C having width of 2cm and thickness 0.2 cm with a magnetic field induction of 2T along the smaller dimension, a current of 150 mA is passing. Calculate the current density and Hall voltage.	02
	c.	State and explain Heisenberg's uncertainty principle.	02
	d.	Distinguish between direct and indirect band gap with examples.	02
	e.	An electron is bound in a one-dimensional potential well of width 5 A^0, but of infinite height. Find the energy values in the ground state and first excited state.	02
	f.	Write a short note on PN Photodiode.	02
	g.	State and explain Phase velocity and group velocity.	02
Q.2.	a.	Derive an expression for energy of a particle in one dimensional infinite potential well.	05
		OR	
	b.	With energy band diagram explain the variation of Fermi level with temperature in extrinsic semiconductors.	05
Q.3	a.	State and explain hall-effect in semiconductors. Derive the expression for hall voltage and hall coefficient.	05
		OR	
	b.	Derive one dimensional Time Dependent Schrodinger Equation (TDSE).	05

Estd. in 2001

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IN-SEMESTER ASSESSMENT (ISE-II) JANUARY-2023
FE / FT (Semester-I) CBCGS-HME 2020
PHYSICS

Branch: CIVIL, COMP, CS&E, E&CS, IoT, AI&DS
Div: A, B & C
Duration: 60 Minutes
Instructions –

Date : 23/01/2023
Timing: 1:30 PM to 2:30 PM
Maximum Marks: 20

1. All questions are compulsory.
2. Assume suitable data wherever necessary and state the assumptions made.
3. Diagrams / sketches should be given wherever necessary.
4. Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5. Figures to the right indicate full marks.

Q.1		**Solve any 5 Questions.**	**Marks**
	a.	What is population inversion? Explain type of pumping.	02
	b.	The transition temperature for Pb is 11.2 K. However, at 8 K it loses the superconducting property if subjected to magnetic field of 4.2×10^4 A/m. Find the maximum value of H which will allow the metal to retain its superconductivity at 0°K.	02
	c.	A soap film of refractive index 1.23 and thickness 1.7×10^{-4} cm is illuminated by white light incident at an angle of 60°. In the reflected light a dark band is observed by the wavelength 5×10^{-5} cm. Calculate the order of the interference band.	02
	d.	Two glass plates touch each other to form a wedge shape air film of thickness 0.06×10^{-3} m at one edge and separated by a wire of 0.15 m at another end. If a monochromatic light of wavelength 6000 Å illuminates the wedge. Find out fringe width.	02
	e.	Write a short note on Anti-reflection coating.	02
	f.	Write a short note on Holography.	02
	g.	Define: i) Population inversion ii) Metastable state	02
Q.2.	a.	With the help of Energy level Diagram describe construction and working in Nd-YAG Laser. State its applications.	05
		OR	
	b.	Derive 1st & 3rd Maxwell's equations in Integral & differential Forms.	05
Q.3	a.	Explain Meissner effect in superconductivity. Also, prove that superconductors are diamagnetic in nature.	05
		OR	
	b.	Derive the expression for nth dark and bright newton's ring.	05

END SEMESTER EXAMINATION, FEBRUARY 2023

SEMESTER I (CBCGS-HME 2020)

Branch:	**Group-I (COMP, CIVIL, CSE, E&CS, AI&DS, IoT)**	**Q.P. Code:**	**R1G10011**
Subject:	**Physics**	**Duration:**	**2 hours**
Subject Code:	**BSC101**	**Max.Marks:**	**60**

Instructions:
1. **All sections are compulsory**
2. **Figures to the right indicate full marks.**
3. **Assume suitable data if necessary and state the assumptions clearly.**

Section-I	**Short Answer Question (Answer any 05 questions out of 06) (Fundamental , Core Types)**				**(10 Marks)**
Q. No.		**Marks**	**CO**	**RBT Level**	**PI**
1	Define Intrinsic and Extrinsic Semiconductors.	2	CO1	U	1.4.1
2	Write Maxwell's first equation in both differential and integral form.	2	CO6	U	1.2.1
3	State the importance of E-k diagram.	2	CO2	U	1.4.1
4	State Heisenberg's Uncertainty Principle.	2	CO3	R	1.2.1
5	Why the rings in the Newton's Ring experiment are circular?	2	CO4	U	1.4.1
6	State four important properties of a LASER.	2	CO5	R	1.2.1
Section-II	**Descriptive Answer Questions(Answer any 04 out of 06) (Descriptive ,Comprehension Types)**				**(20 Marks)**
1	With the energy band diagram, explain the variation of Fermi level with impurity concentration in extrinsic semiconductors.	5	CO1	U	1.4.1
2	Explain with appropriate diagram, the working of Maglev Train.	5	CO5	A	1.3.1
3	Differentiate between Direct and Indirect Band Gap Semiconductors.	5	CO2	U	1.4.1
4	Calculate de-Broglie wavelength associated with alpha particle accelerated by a potential difference of 27 KV.	5	CO3	R	1.3.1
5	Find the thickness of the soap film which will appear yellow 5890 A^0 in reflection when it is exposed to white light at an angle of 45^0 . The refractive index of soap film = 1.34.	5	CO4	A	1.3.1
6	Derive Time Dependent Schrodinger Equation.	5	CO3	U	1.5.1

Section-III	Long Answer Question (Answer any 03 out of 05) (Application, Analytical, Evaluation, Design Type)				(30 Marks)
1	a) Derive Maxwell third and fourth equation. a) What is the probability of an electron being thermally excited to the conduction band in intrinsic Si at 27^0C . The band gap energy is 1.24 eV.	10	CO6 CO1	U A	1.5.1 1.3.1
2	b) Differentiate between Spontaneous and Stimulated Emission. c) An electron is confined in a box of length 10^{-9} m. Calculate the minimum uncertainty in its velocity.	10	CO5 CO3	U A	1.4.1 1.3.1
3	a) Derive the conditions for maxima and minima due to interference of light reflected from the thin transparent film of uniform thickness. b) An n-type of Ge sample has a $N_D = 2 \times 10^{21}/m^3$ and thickness 4 mm. It is arranged in a hall effect experimental set up. If B = 0.5 T, J = 510 A/m^2, find hall voltage.	10	CO4 CO1	R A	1.5.1 1.3.1
4	a) Prove that electron does not exist inside the nucleus. b) Two glass surfaces in contact along one edge are separated at opposite edge by a thin wire. If 18 interference fringes are observed between these edges in sodium light of $\lambda = 5890$ A^{0}at normal incidence, what is the thickness of the wire?	10	CO3 CO4	U A	1.4.1 1.3.1
5	a) Explain Hall Effect, and derive its mathematical expression for Hall voltage. b) The transition temperature for lead is 7.23 K. The maximum critical field for the material is 8×10^5 A/m. Lead has to be used as a superconductor subjected to a magnetic field of 7×10^4 A/m. What precaution will have to be taken?	10	CO1 CO5	U A	1.5.1 1.3.1