

Guru Nanak Dev Engineering College, Ludhiana			
Department of Information Technology			
Program	B.Tech.(MEA, MEB, ITA, ITB)	Semester	2
Subject Code	BSC-101	Subject Title	Physics
Mid Semester Test (MST) No.	1	Course Coordinator(s)	Dr. Harpreet Kaur, Dr. Randhir Singh, Dr. Paramjit Singh, Dr. Amarjot Kaur
Max. Marks	24	Time Duration	1 hour 30 minutes
Date of MST	15 May, 2023	Roll Number	2217026

Note: Attempt all questions

Q. No.	Question	COs, RBT level	Marks
Q1	Differentiate Between Spontaneous and stimulated emission.	CO1, L2	2
Q2	What is difference between Step index and Graded index optical fibre?	CO1, L2	2
Q3	Explain in detail principle, construction and working of Ruby laser. OR Discuss different types of losses in an optical fibre.	CO1, L3	4
Q4	(i) The light gathering ability of an optical fibre is 0.479. The fractional refractive index between core and cladding is 0.0005. Calculate the refractive index of the cladding, outside medium is air. (ii) Find the diameter of the core for single mode transmission at wavelength 8500×10^{-10} m, whose refractive indices for core and cladding are 1.48 and 1.47 respectively.	CO1, L3	2 2
Q5	(i) What is the significance of critical temperature (T_c) and critical magnetic field (H_c) for superconductor? (ii) The transition temperature of a superconducting material is 8.0K. Calculate the maximum value of critical magnetic field ($H_c(0)$) required to change superconducting state into the normal conducting state. Given that critical magnetic field of 10^4 tesla is required at a temperature of 4.0K	CO1, L3	2 2
Q6	(i) Derive London's first and second equation and discuss how its solution leads to Meissner effect. (ii) What is an optical fibre? What are main sections of an optical fibre? Describe the function of each section. (iii) The critical field for superconducting material is 2×10^4 A/m at 10K and 4×10^4 A/m at 0K. Calculate critical temperature of the material.	(a) CO5, L3 (b) CO5, L3	4 2 2

Course Outcomes (CO): Students will be able to

1	Solve the problems in the fields of electromagnetism lasers and fibre optics.
2	Apply the knowledge acquired from the study of semiconductors to identify their use in latest technology.
3	Recognise the inadequacy of classical mechanics for certain physical problems and thus find the solutions of these problems using principles of quantum physics.
4	Comprehend the concept of oscillations and hands to implement the same in the theory of machines.
5	Understand the basic characteristics of materials relevant to engineering and technology applications.
6	Apply multi disciplinary knowledge of science complex problems from different angles perspectives and to find the best possible solution model.

RBT Classification	Lower Order Thinking Levels (LOTS)			Higher Order Thinking Levels (HOTS)		
RBT Level Number	L1	L2	L3	L4	L5	L6
RBT Level Name	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating

Physics

Guru Nanak Dev Engineering College Ludhiana

Department of Applied Sciences

Program	B.Tech. 1st ECE A	Semester	2nd
Subject Code	BSC- 101	Subject Title	Physics
Mid Semester Test (MST) No.	1st	Class Teacher	Dr. Harpreet Kaur Grewal
Max. Marks	24	Time Duration	1 Hr. 30 Mins
Date of MST	April 01, 2023	Roll Number	

Note: Attempt all questions.

Q. No.	Question	COs, RBT level	Marks
(Q1)	Show that isolated poles do not exist in nature.	CO1, L3	2
(Q2)	Explain the concept of divergence of a vector field. Write condition for the vector field to be solenoidal.	CO1, L2	2
(Q3)	What are EM waves? Derive Maxwell's wave equation for the propagation of EM waves through free space. Also find speed of EM waves in free space.	CO1,6; L5	4
(Q4)	Given $\vec{A} = x^2yz\hat{i} - xy^2z\hat{j} + xyz^2\hat{k}$. Find divergence and curl of \vec{A} at point $(1, 1, -1)$. Comment on the nature of A , whether it is source/sink field, rotational/ irrotational/ solenoidal/ conservative field. $\vec{A} = 2 \text{ curl } \vec{A} \neq 0$	CO1,6; L4	4
(Q5)	What would be the de-Broglie wavelength associated with (i) a 2000 kg car having a constant speed of 25 m/s, (ii) an 80 kg scooter having a speed of 10 m/s, (iii) an electron moving with a speed of 500 m/s and (iv) a proton moving with a speed of 250 m/s. Given $h = 6.62 \times 10^{-34} \text{ Js}$. Draw conclusions. $1.32 \times 10^{-38} \text{ m}$ (ii) $0.82 \times 10^{-36} \text{ m}$ (iii) $0.148 \times 10^{-10} \text{ m}$ (iv) $8.8 \times 10^{-10} \text{ m}$	CO3, L6	4
(Q6)	Explain the concept of Meissner effect. (a) Based on Meissner effect, give classification of superconductors. Also write some applications of superconductors. (4 marks) (b) At zero magnetic field, a superconductor has a critical temperature of 3.7 K. At 0 K, the critical magnetic field is 0.306 T. Calculate critical magnetic field at 2.0 K and 5.0 K. $H_{C2} = 0.017 \times 10^7$ (4 marks)	CO5,6, L3	8

Course Outcomes (CO)

Students will be able to

- 1 Solve the problems in the fields of electromagnetism, lasers and fiber optics.
- 2 Apply the knowledge acquired from the study of semiconductors to identify their use in latest technologies.
- 3 Recognize the inadequacy of classical mechanics for certain physical problems and thus find the solutions of these problems using principles of quantum physics.
- 4 Comprehend the concept of oscillations and hence to implement the same in the theory of machines.
- 5 Understand the basic characteristics of materials relevant to engineering and technological applications.
- 6 Apply multidisciplinary knowledge of science for reviewing complex problems from different angles/perspectives and to find the best possible solution/model.

$$H_{CSF} = 0.020 \times 10^7$$

RBT Classification	Lower Order Thinking Levels (LOTS)			Higher Order Thinking Levels (HOTS)		
RBT Level Number			L3	L4	L5	L6
RBT Level Name	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating

Super computers

Guru Nanak Dev Engineering College, Ludhiana

Department of Applied Sciences

Program	B.Tech.(ME, IT, EC)	Semester	2
Subject Code	BSC-101	Subject Title	Physics
Mid Semester Test (MST) No.	2	Course Coordinator(s)	Dr. Harpreet Kaur, Dr. Randhir Singh, Dr. Paramjit Singh, Dr. Amarjot Kaur
Max. Marks	24	Time Duration	1 hour 30 minutes
Date of MST	26 May, 2023	Roll Number	

Note: Attempt all questions

Q. No.	Question	COs, RBT level	Marks
Q1	Differentiate between drift current and diffusion current.	CO2, L4	2
Q2	What is the physical significance of divergence and curl of a vector field?	CO6, L1	2
Q3	Differentiate intrinsic and extrinsic semiconductors. Discuss the position of Fermi level in both cases. OR Write a brief note on LED and Solar cell.	CO2, L4	4
Q4	(i) Write the Maxwell's equations in differential and integral form. (ii) Calculate the energy of the neutron in eV if its de Broglie wavelength is 3×10^{-10} m. mass of neutron = 1.66×10^{-27} kg 3.53×10^{-7} ev \cancel{CO}	CO3, L1	2 2
Q5	Derive the differential equation for harmonic oscillator. Also show that total energy of the harmonic oscillator is constant at any instant of time.	CO4, L3	4
Q6	(i) Derive expression for time independent Schrodinger wave equation. (ii) Calculate the de-Broglie wavelength associated with electrons, which are accelerated by a voltage of 50keV. Where $h = 6.63 \times 10^{-34}$ joule sec. and Mass of electron = 9.1×10^{-31} Kg. $\lambda = 0.549 \times 10^{-11}$ m ✓ (iii) Calculate the velocity and de Broglie wavelength of a proton having energy 10^5 eV. Given that: mass of proton = 1.66×10^{-27} kg. 16	(i) CO3, L3 (ii) CO3, L1 (iii) CO3, L1	4 2 2

Course Outcomes (CO): Students will be able to

$$v = 1.097 \times 10^7 \text{ m/s}$$

1	Solve the problems in the fields of electromagnetism lasers and fibre optics.
2	Apply the knowledge acquired from the study of semiconductors to identify their use in latest technology.
3	Recognise the inadequacy of classical mechanics for certain physical problems and thus find the solutions of these problems using principles of quantum physics.
4	Comprehend the concept of oscillations and hands to implement the same in the theory of machines.
5	Understand the basic characteristics of materials relevant to engineering and technology applications.
6	Apply multi disciplinary knowledge of science complex problems from different angles perspectives and to find the best possible solution model.

RBT Classification	Lower Order Thinking Levels (LOTS)			Higher Order Thinking Levels (HOTS)		
RBT Level Number	L1	L2	L3	L4	L5	L6
RBT Level Name	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating

Physics

(1) A.

Guru Nanak Dev Engineering College, Ludhiana			
Department of Applied Sciences			
Program	B.Tech.(CE34)	Semester	2
Subject Code	BSC-18101	Subject Title	Physics
Mid Semester Test (MST) No.	1	Course Coordinator(s) Subject Expert	Dr Harpreet Kaur Grewal Dr Randhir Singh
Max. Marks	24	Time Duration	1 hour 30 minutes
Date of MST	23 rd Feb, 2019	Roll Number	

Note: Attempt all questions

Q. No.	Question	Marks
Q1	A vector field is given as : $\vec{A} = xy\hat{i} + yz\hat{k}$. Find $\vec{\nabla} \times \vec{A}$ and tell whether the field is conservative or not.	2
Q2	Define Poynting vector. Give its significance.	2
Q3	Define Meissner effect and differentiate type-I, type-II superconductors.	4
Q4	Derive London equations and give their significance.	4
Q5	The critical magnetic field for a superconductor at absolute zero is $9 \times 10^4 \text{ Am}^{-1}$ and at 6K is $5 \times 10^4 \text{ Am}^{-1}$. Find the critical temperature and energy required to break Cooper pair at absolute zero.	4
Q6	<p>(i) Show that for plane electromagnetic waves propagating in vacuum, electric field is perpendicular to magnetic field as well as to direction of propagation.</p> <p>(ii) Write Maxwell's equations and give their significance.</p>	5
		3

**GURU NANAK DEV ENGINEERING COLLEGE
GILL PARK, GILL ROAD, LUDHIANA
MST-I**

Subject Name:-Physics (BSC-18101)
Section:- PEI2

Semester-2nd

Max. Marks: 24
Time: 90 Minutes

- Note:- (i) All questions are compulsory.
(ii) Marks for each question are shown in the brackets.
(iii) Use of calculator is allowed.

- Keep
cool*
- Q.1** What is meant by Inverted Population in laser? (2)
- Q.2** Calculate the de-Broglie wavelength of a virus particle accelerated by a potential difference of 30,000V. (2)
- Q.3** Describe the construction and working of Helium Neon laser. (4)
- Q.4** Show that how group velocity is related to phase velocity. (4)
- Q.5** Write a note on attenuation & propagation loss mechanisms in fibres. (4)
- Q.6** (i) Define acceptance angle for an optical fibre. Show that it is related to numerical aperture. (5)
(ii) An optics fibre is made of glass with refractive index 1.55 and is clad with another glass of refractive index 1.51. The fibre has a core of diameter $50\mu\text{m}$ and is used at a light wavelength of $0.8 \mu\text{m}$. Determine:
(a) Numerical aperture (b) Acceptance angle (c) V-number for the fiber. (3)

Guru Nanak Dev Engineering College, Ludhiana

Department of Applied Sciences

Program	B.Tech.(ME1,ME2, ME5,ME6)	Semester	2
Subject Code	BSC-18101	Subject Title	Engg. Physics
Mid Semester Test (MST) No.	1	Course Coordinator(s)	Dr Harpreet Kaur Grewal
Max. Marks	24	Time Duration	1 hour 30 minutes
Date of MST	23 rd February, 2019	Roll Number	

Note: Attempt all questions

Q. No.	Question	Marks
(Q1)	Differentiate Stimulated Emission and Spontaneous emission?	2 F
(Q2)	In LASER, in place of 'A', it should be 'O' Why?	2 F
(Q3)	Explain the terms Acceptance angle and Figure of Merit. What do you mean by single mode and multimode fiber?	4
(Q4)	An optical fiber has NA of 0.15 and cladding refractive index is equal to 1.50. Find NA of the fiber in a liquid of refractive index 1.30.	4
(Q5)	Discuss the variation of Fermi Level with temperature for extrinsic semiconductor.	4
(Q6)	(a) Explain the energy level diagram of He- Ne Laser and what is the role of helium in He-Ne Laser? (b) What do you mean by Extrinsic Semiconductor?	6 F 2

(4)

**GURU NANAK DEV ENGINEERING COLLEGE
GILL PARK, GILL ROAD, LUDHIANA**

MST-I

Subject Name:- Physics (BSC-18101)

Section:- CE12, CE56

Semester-2nd

Max. Marks: 24

Time: 90 Minutes

Note:- (i) All questions are compulsory.
 (ii) Marks for each question are shown in the brackets.
 (iii) Use of calculator is allowed.

Q.1. Write Maxwell's Electromagnetic equations for vacuum. (2)

Q.2. What makes laser light different from normal? (2)

Q.3. A step-index fiber has a core index of refraction 1.425. The cut-off angle for light entering the fiber from air is found to be 8.50° .
 (a) What is the numerical aperture of the fiber?
 (b) What is the index of refraction of its cladding?
 (c) Find the Fractional Refractive Index change.
 (d) If the fiber were submersed in water, what would be the new cut-off angle at the launching end of fiber?

Q.4. Explain the working of a Continuous Wave (CW) laser. (4)

Q.5. Derive Maxwell's Electromagnetic equation from Faraday's Law of EM Induction. (4)

Q.6. (a) Write the statements of Gauss Divergence Theorem and Stoke's Curl Theorem. (2)
 (b) Give brief significance of Einstein coefficients and show how they are related. (3)
 (c) What causes most fiber optic attenuation and propagation losses? (3)

Physics

(5)

Guru Nanak Dev Engineering College, Ludhiana

Department of Information Technology

Program	B.Tech.	Semester/Section	1 st / EEA, CEA, CSA
Subject Code	BSC-101	Subject Title	PHYSICS
Mid Semester Exam (MSE) No.	1	Course Coordinator(s)	Dr. Randhir Singh Dr. Harpreet Kaur Grewal
Max. Marks	24	Time Duration	1 hour 30 minutes
Date of MST	17-11-2022(9.00-10.30am)	Roll Number	2210053

Note: Attempt all questions

Q. No.	Question	COs, RBT level	Marks
Q1	With a neat diagram, explain the structure of an optical fibre.	CO1, L1	2
Q2 (a)	Find the intensity of a laser beam of 10mW power having laser beam diameter as 1cm. <i>OR</i> Newton's law of universal gravitation is represented by $\vec{F} = \left(\frac{GMm}{r^2}\right) \hat{r}$, where F is the magnitude of the gravitational force exerted by one object on another, M and m are the masses of the objects, and r is a distance. Find the curl of gravitational field?	CO1, L3, L4, L5	2
Q3	Explain the construction and working of He-Ne laser with appropriate energy level diagram.	CO1, L1, L2	4
Q4	How does a laser work? Explain active medium, population inversion, optical pumping and optical cavity resonators.	CO1, L2, L4	4
Q5	Calculate, $\operatorname{div}(\vec{r}/r^2)$, where $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$? <i>OR</i> Calculate the refractive indices of the core and the cladding material of a fiber, if numerical aperture is 0.22 and fractional refractive index change is 0.012.	CO1, L2, L4, L5	4
Q6 (a)	Explain with necessary ray theory, the propagation of light in optical fibres. Derive an expression for numerical aperture. <i>OR</i> Obtain the relation between transition probabilities of spontaneous and stimulated emissions. Mention characteristic properties of a laser beam.	CO1, L3, L4, L6	8

RBT Classification		Lower Order Thinking Levels (LOTS)			Higher Order Thinking Levels (HOTS)		
RBT Level Number	RBT Level Name	L1	L2	L3	L4	L5	L6
		Remembering	Understanding	Applying	Analyzing	Evaluating	Creating

In this pumping
 In pumping
 active medium
 pumping
 optical resonator

Thus
 emission in the process

$$(\text{cross product of electric \& magnetic field})$$

$$\vec{J} = \vec{E} \times \vec{H}$$

Physics

$$\vec{J} = \frac{\partial}{\partial t} \vec{H} = \frac{\partial \vec{B}}{\partial t} + \vec{J}$$

6

Guru Nanak Dev Engineering College, Ludhiana

Department of Applied Sciences

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Guru Nanak Dev Engineering College, Ludhiana			
Department of Applied Sciences			
Program	B.Tech.	Semester/Section	1 st / CE A, CSA
Subject Code	BSC-101	Subject Title	PHYSICS
Mid Semester Exam (MSE) No.	2	Course Coordinator(s)	Dr. Randhir Singh Dr. Harpreet Kaur Grewal
Max. Marks	24	Time Duration	1 hour 30 minutes
Date of MST	23-12-2022 (9.30-11.00 am)	Roll Number	
Note : All questions will be objective type.			

Note: Attempt all questions

Q. No.	Question	COs, RBT level	Marks
Q1	What are semiconductors? Write two ways to increase the conductivity of intrinsic semiconductors.	CO2, L2	2
Q2	Differentiate n type and p type semiconductors.	CO2, L4	2
Q3	Classify magnetic materials based on their behavior in an external magnetic field and compare their properties.	CO5, CO6, L2, L4	4
Q4	Write four Maxwell equations and give their significance.	CO1, L2	4
Q5	Given critical magnetic field of material at 0K (i.e., $H_c(0)$) is 15×10^{-3} A/m. Calculate critical magnetic field at temperature 5K (i.e., $H_c(5K)$) for the same material. Given $T_c=7K$.	CO6, L4	4
Q6	(A) Using Maxwell equations, deduce Maxwell's em wave equation for free space. (B) Given $\mathbf{E} = 3x^2\mathbf{i} - 6xy\mathbf{j} + 12z^2xy\mathbf{k}$. Find divergence of the given vector field and comment on its nature whether field is converging or diverging. (C) Define Poynting vector.	CO1, L4 CO1, L4 CO1, L1	4 3 1

RBT Classification	Lower Order Thinking Levels (LOTS)			Higher Order Thinking Levels (HOTS)		
RBT Level Number	L1	L2	L3	L4	L5	L6
RBT Level Name	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating

$$3x^2y - 6xy + 12z^2y$$

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Guru Nanak Dev Engineering College, Ludhiana
Department of Applied Sciences

Program	B.Tech.	Semester/Section	1 st / CE A, CSA
Subject Code	BSC-101	Subject Title	PHYSICS
Mid Semester Exam (MSE) No.	2	Course Coordinator(s)	Dr. Randhir Singh Dr. Harpreet Kaur Grewal
Max. Marks	24	Time Duration	1 hour 30 minutes
Date of MST	23-12-2022 (9.30-11.00 am)	Roll Number	

Note: Attempt all questions

Q. No.	Question	COs, RBT level	Mark
Q1	What are semiconductors? Write two ways to increase the conductivity of intrinsic semiconductors.	CO2, L2	2
Q2	Differentiate n type and p type semiconductors.	CO2, L4	2
Q3	Classify magnetic materials based on their behavior in an external magnetic field and compare their properties.	CO5, CO6, L2, L4	4
Q4	Write four Maxwell equations and give their significance.	CO1, L2	4
Q5	Given critical magnetic field of material at 0K (i.e., $H_c(0)$) is 15×10^3 A/m Calculate critical magnetic field at temperature 5K (i.e., $H_c(5K)$) for the same material. Given $T_c = 7K$.	CO6, L4	4
Q6	(A) Using Maxwell equations, deduce Maxwell's eqn wave equation for free space. (B) Given $E = 3x^2 i - 6xy j + 12z^2 xy k$. Find divergence of the given vector field and comment on its nature whether field is converging or diverging. (C) Define Poynting vector.	CO1, L4 CO1, L4 CO1, L1	4 3 1

RBT Classification	Lower Order Thinking Levels (LOTS)			Higher Order Thinking Levels (HOTS)		
RBT Level Number	L1	L2	L3	L4	L5	L6
RBT Level Name	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating

Q. What is the principle of working of optical fiber?

• What are the various conditions for acceptability of wave function?

Q. What do you understand by numerical aperture & acceptance angle of an optical fibre. Also derive expressions for ~~shee~~ some.

Q. Difference between step index fibre and graded index fibre? Use suitable diagrams.

5. With relative Permeability $\mu_r = 1$ & relative permittivity $\epsilon_r = 3$ has an electric field intensity $E_v = 6 \text{ V/m}$. Find the impedance of the medium.

Q. Write Maxwell's equations in differential form and discuss in brief physical significance of each.

Physics

Program
Subject
Year

(0)

Guru Nanak Dev Engineering College, Ludhiana Department of Information Technology

Program	B.Tech.	Semester/Section	I st / EEA, CEA, CSA
Subject Code	BSC-101	Subject Title	PHYSICS
Mid Semester Exam (MSE) No.	1	Course Coordinator(s)	Dr. Randhir Singh Dr. Harpreet Kaur Grewal
Max. Marks	24	Time Duration	1 hour 30 minutes
Date of MST	17-11-2022(9.00-10.30am)	Roll Number	2216062

Note: Attempt all questions

Q. No.	Question	COs, RBT level	Marks
Q1	With a neat diagram, explain the structure of an optical fibre.	CO1, L1	2
Q2 a	Find the intensity of a laser beam of 10mW power having laser beam diameter as 1cm.	CO1, L3, L4, L5	2
Q3 b	Newton's law of universal gravitation is represented by $\vec{F} = \left(\frac{GMm}{r^2}\right)\hat{r}$, where \vec{F} is the magnitude of the gravitational force exerted by one object on another, M and m are the masses of the objects, and r is a distance. Find the curl of gravitational field?		
Q4	Explain the construction and working of He-Ne laser with appropriate energy level diagram. How does a laser work? Explain active medium, population inversion, optical pumping and optical cavity resonators.	CO1, L1, L2 CO1, L2, L4	4 4
Q5	Calculate, div (\vec{r}/r^2) , where $\vec{r} = xi + yj + zk$? <i>OR</i> Calculate the refractive indices of the core and the cladding material of a fiber, if numerical aperture is 0.22 and fractional refractive index change is 0.012.	CO1, L2, L4, L5	4
Q6 a	Explain with necessary ray theory, the propagation of light in optical fibres. Derive an expression for numerical aperture. <i>OR</i> Obtain the relation between transition probabilities of spontaneous and stimulated emissions. Mention characteristic properties of a laser beam.	CO1, L3, L4, L6	8

RBT Classification	Lower Order Thinking Levels (LOTS)			Higher Order Thinking Levels (HOTS)		
	L1	L2	L3	L4	L5	L6
RBT Level Number	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating

Guru Nanak Dev Engineering College, Ludhiana

Department of Applied Sciences

Program	B.Tech.	Semester	CS D, CE B
Subject Code	BSC-101	Subject Title	PHYSICS
Mid Semester Examination (MSE) No.	2	Course Coordinator(s)	Dr. Randhir Singh Dr. Harpreet Kaur Grewal
Max. Marks	24	Time Duration	1 hour 30 minutes
Date of MST	23-12-2022	Roll Number	

Note: Attempt all questions

Q. No.	Question	COs, RBT level	Marks
Q1	Define Fermi level and give its physical significance.	CO2, L3	2
Q2	What are Matter waves? Write expression of their wavelength.	CO3, L2	2
Q3	Define Phase velocity and group velocity. Prove that particle velocity is equal to group velocity for non-relativistic speeds.	CO3, L4	4
Q4	Differentiate (i) intrinsic and extrinsic semiconductors (ii) n type and p type semiconductors	CO2, L4	2-2
Q5	An electron and a proton are moving with same speed of 300 m/s. Compare the magnitude of de-Broglie wavelength for these particles. Given mass of an electron = 9.1×10^{-31} kg, mass of a proton = 1.67×10^{-27} kg and Planck's Constant $\hbar = 6.62 \times 10^{-34}$ Js.	CO3, L4 $\lambda = \frac{h}{mv}$	4
Q6	(A) Calculate energy eigen values of a particle moving in 1-D box having width L. (B) Derive time independent Schrodinger wave equation for 1-D motion of a free particle.	CO3, L4, L2	4-4

RBT Classification	Lower Order Thinking Levels (LOTS)			Higher Order Thinking Levels (HOTS)		
RBT Level Number	L1	L2	L3	L4	L5	L6
RBT Level Name	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating

$$\text{Given } v = 300 \text{ m/s}$$

$$m_e = 9.1 \times 10^{-31} \text{ kg}$$

$$m_p = 1.67 \times 10^{-27} \text{ kg}$$

$$\hbar = 6.62 \times 10^{-34} \text{ Js}$$

$$\lambda = \frac{\hbar}{mv}$$

$$\lambda_e = \frac{6.62 \times 10^{-34}}{9.1 \times 10^{-31} \times 300}$$

$$\lambda_p = \frac{6.62 \times 10^{-34}}{1.67 \times 10^{-27} \times 300}$$

$$\lambda_e = 2.23 \times 10^{-10} \text{ m}$$

$$\lambda_p = 3.86 \times 10^{-10} \text{ m}$$

$$\lambda_e < \lambda_p$$

$$\lambda_e = 2.23 \times 10^{-10} \text{ m}$$

$$\lambda_p = 3.86 \times 10^{-10} \text{ m}$$

$$\lambda_e < \lambda_p$$

$$\lambda_e = 2.23 \times 10^{-10} \text{ m}$$

$$\lambda_p = 3.86 \times 10^{-10} \text{ m}$$

Guru Nanak Dev Engineering College, Ludhiana
Department of Applied Sciences

Program	B.Tech.(ME34)	Semester	2
Subject Code	BSC-18101	Subject Title	Physics
Mid Semester Test (MST) No.	1	Course Coordinator(s)	Dr Harpreet Kaur Grewal
		Subject Expert	Dr Randhir Singh
Max. Marks	24	Time Duration	1 hour 30 minutes
Date of MST	23 rd Feb, 2019	Roll Number	

Note: Attempt all questions

Q. No.	Question	Marks
Q1	A vector field is given as : $\vec{A} = xy\hat{i} + yz\hat{k}$. Find $\vec{\nabla} \times \vec{A}$ and tell whether the field is conservative or not.	2
Q2	Define Poynting vector. Give its significance.	2
Q3	Define stress and strain and give their types.	4
Q4	Discuss briefly, the motion of a lightly damped oscillator.	4
Q5	The displacement of a particle executing SHM is changing with time as $x = A \cos \omega_0 t$. Find the displacement at which kinetic energy of the particle is equal to its potential energy.	4
Q6	(i) Show that for plane electromagnetic waves propagating in vacuum, electric field is perpendicular to magnetic field as well as to direction of propagation. (ii) Write Maxwell's equations and give their significance.	5
		3

Guru Nanak Dev Engineering College, Ludhiana
Department of Information Technology

Program	B.Tech.(MEA, MEB, ITA, ITB)	Semester	2
Subject Code	BSC-101	Subject Title	Physics
Mid Semester Test (MST) No.	1	Course Coordinator(s)	Dr. Harpreet Kaur, Dr. Randhir Singh, Dr. Paramjit Singh, Dr. Amarjot Kaur
Max. Marks	24	Time Duration	1 hour 30 minutes
Date of MST	01 April, 2023	Roll Number	

Note: Attempt all questions

Q. No.	Question	CO, RBT level	Marks
Q1	Differentiate stimulated and spontaneous emission.	CO1, L3	2
Q2	Explain the concept of total internal reflection and give examples based on daily life.	CO1, L2	2
Q3	Derive relationship amongst three Einstein's coefficients and right conditions necessary for lasing action to take place. OR Explain the construction and working of helium neon laser. Draw well labelled diagrams wherever necessary.	CO1, L3	4
Q4	Define and give physical significance of acceptance angle and numerical aperture. Derive expressions for acceptance angle and numerical aperture. Also express numerical aperture in terms of Δ , that is fractional change in a refractive index of fibre.	CO1, L3	4
Q5	Step Index fibre has numerical aperture of 0.26 a core of refractive index 1.5 and diameter $100\mu\text{m}$. Calculate refractive index of cladding, angle of acceptance and critical angle at core clad interface, fractional change in a refractive index and cut off wavelength that can be passed through optical fibre with minimum loss.	CO1, L3, L4	4
Q6	(a) Explain the concept of Meissner effect and hence differentiate type-I and type-II superconductors. Also write some applications of superconductors. (b) The critical temperature of a superconductor at zero applied magnetic field is 3.7K. At 0K, the critical magnetic field is 0.306T . Calculate critical magnetic fields of the superconductor at 2K and 5K.	(a) CO1, L3 (b) CO6, L3, L5	(4+4=8)

Course Outcomes (CO): Students will be able to

1	Solve the problems in the fields of electromagnetism lasers and fibre optics.
2	Apply the knowledge acquired from the study of semiconductors to identify their use in latest technology.
3	Recognise the inadequacy of classical mechanics for certain physical problems and thus find the solutions of these problems using principles of quantum physics.
4	Comprehend the concept of oscillations and hands to implement the same in the theory of machines.
5	Understand the basic characteristics of materials relevant to engineering and technology applications.
6	Apply multi disciplinary knowledge of science complex problems from different angles perspectives and to find the best possible solution model.

RBT Classification	Lower Order Thinking Levels (LOTS)			Higher Order Thinking Levels (HOTS)		
	L1	L2	L3	L4	L5	L6
RBT Level Name	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating

$$\frac{2\pi D}{n\sqrt{D^2 - n^2}}$$

$$\frac{2\pi r}{n\sqrt{r^2 - n^2}}$$

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Department of Information Technology

Program	B.Tech.(ME, EC, EE and CE)	Semester	1
Subject Code	BSC-101	Subject Title	Physics
Mid Semester Test (MST) No.	2	Course Coordinator(s)	Dr. Harpreet Kaur, Dr. Randhir Singh, Dr. Paramjit Singh, Dr. Amarjot Kaur, Akshdeep Kaur
Max. Marks	24	Time Duration	1 hour 30 minutes
Date of MST	8, November, 2023	Roll Number	

Note: Attempt all questions

Q. No.	Question	COs, RBT level	Marks
Q1	Write the concept of de-Broglie hypothesis.	CO3, L1	2
Q2	Compare type-I and type-II superconductors.	CO5, L5	2
Q3	(a) Determine the critical magnetic field of lead at temperature 5K. The critical temperature for Pb is 8K and critical magnetic field is 2×10^4 A/m at 0K. (b) The critical magnetic field for a superconductor at absolute zero is 9×10^4 Am ⁻¹ and at 6K is 5×10^4 Am ⁻¹ . Find the critical temperature.	CO5, L3 CO5, L3	(2+2=4)
Q4	Derive Maxwell's Electromagnetic equation from Faraday's Law of EM Induction and write its physical significance.	CO1, L3	4
Q5	(a) Figure out the value of q at point P (-1,0,1) if the given vector is solenoidal. $A = qx^2 + 3y^3 + 12z$ (b) What will be the electric field vector for the electric potential $V(x, y, z) = 4x^3 + 3y^2 - 9z^2$ and its magnitude at point P (-1,2,1).	CO1, L4 CO1, L4	(2+2=4)
Q6	(a) Support with examples that Newton's laws fail for motion of subatomic particles. Hence obtain expression for time independent Schrodinger wave equation and give its importance. (b) An electron is confined to one dimensional potential box of length 3 Å. Calculate the energies corresponding to the first and second quantum states in eV. (c) Estimate the de-Broglie wavelength of an electron accelerated by a potential difference of 300V. ($h = 6.626 \times 10^{-34}$ Js, mass of an electron = 9.1×10^{-31} kg).	CO3, L5 CO3, L3 CO3, LS	(1+3+2+2=)

Course Outcomes (CO): Students will be able to

1	Solve the problems in the fields of electromagnetism, lasers and fiber optics.
2	Apply the knowledge acquired from the study of semiconductors to identify their use in latest technology.
3	Recognise the inadequacy of classical mechanics for certain physical problems and thus find the solutions of these problems using principles of quantum physics.
4	Comprehend the concept of oscillations and hands to implement the same in the theory of machines.
5	Understand the basic characteristics of materials relevant to engineering and technology applications.
6	Apply multidisciplinary knowledge of science for reviewing complex problems from different angles/perspectives and to find the best possible solution/model.

RBT Classification	Lower Order Thinking Levels (LOTS)			Higher Order Thinking Levels (HOTS)		
	L1	L2	L3	L4	L5	L6
RBT Level Name	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating