20CE/ME102

Hall Ticket Number:

I/IV B.Tech (Regular\Supplementary) DEGREE EXAMINATION

February, 2024 — **Common to CE & ME**

First Semester — **Advanced Optics and Material Testing**

Time: Three Hours — **Maximum:** 70 Marks

Answer question 1 compulsorily. — **(14X1 = 14Marks)**

Answer one question from each unit. — **(4X14=56 Marks)**

			CO	BL	M
1	a)	What is meant by life time of electron?	CO1	L1	1M
	b)	Illustrate stimulated emission.	CO1	L2	1M
	c)	What is a meta stable state?	CO1	L1	1M
	d)	What are the conditions for total internal reflection?	CO1	L1	1M
	e)	Recall De-Broglie hypothesis.	CO2	L1	1M
	f)	What is the wave length of electron accelerated by 10000V?	CO2	L1	1M
	g)	Velocity of matter wave is greater than velocity of light. Justify	CO2	L5	1M
	h)	Outline the Normalization condition for the wave function.	CO2	L2	1M
	i)	State Bloch theorem.	CO3	L1	1M
	j)	What is effective mass of an electron?	CO3	L1	1M
	k)	State Bragg's law.	CO3	L1	1M
	l)	What is the frequency range of Ultrasonics?	CO4	L1	1M
	m)	Expand SONAR.	CO4	L1	1M
	n)	What are isotopes?	CO4	L1	1M
		Unit-I			
2	a)	Explain with neat sketches the construction and working of a Ruby Laser.	CO1	L2	8M
	b)	Outline the industrial and medical applications of Lasers.	CO1	L2	6M
		(OR)			
3	a)	Develop the expressions for Acceptance angle and Numerical aperture of an optical fiber.	CO1	L3	7M
	b)	Outline the different types of optical fibers based on mode and refractive index profile.	CO1	L2	7M
		Unit-II			
4	a)	Explain Davisson and Germer experiment for electron diffraction with neat diagrams.	CO2	L2	8M
	b)	State and explain the two applications of Heisen Berg's uncertainity principle.	CO2	L2	6M
		(OR)			
5	a)	Develop Schrodinger's Time dependent wave equation.	CO2	L3	7M
	b)	Illustrate the construction and working of Scanning Tunnelling microscope.	CO2	L2	7M
		Unit-III			
6	a)	List the failures of Classical free electron theory.	CO3	L1	6M
	b)	Explain Kronig-Penny model with suitable sketches.	CO3	L2	8M
		(OR)			
7	a)	Write a note on Crystal lattices.	CO3	L1	7M
	b)	Explain Crystal planes and Miller indices.	CO3	L2	7M
		Unit-IV			
8	a)	Outline the general applications of Ultrasonics.	CO4	L2	6M
	b)	Illustrate any one method for production of Ultrasonics.	CO4	L2	8M
		(OR)			
9	a)	Explain Pulse echo technique with suitable diagrams.	CO4	L2	6M
	b)	Outline the medical and Industrial applications of radio isotopes.	CO4	L2	8M

20PH002

Hall Ticket Number:

I/IV B.Tech (Regular\Supplementary) DEGREE EXAMINATION

March, 2023 — **Common to CE &ME Branches**

First Semester — **Advanced Optics and Material Testing**

Time: Three Hours — **Maximum:** 70 Marks

Answer Question No.1 compulsorily. (1X14 = 14 Marks)

Answer ONE question from each unit. (4X14=56 Marks)

1		Answer all questions			(1X14=14 Marks)
	a)	What is a LASER?	CO1,L1	1M	
	b)	Define the pumping.	CO1,L1	1M	
	c)	State the principle of an optical fiber.	CO1,L2	1M	
	d)	Write any two advantages of optical fibers ove copper cables.	CO1,L1	1M	
	e)	Give two properties of matter waves	CO2,L2	1M	
	f)	Determine the wavelength of an electron accelerated from rest through a potential difference of 100 volts.	CO2,L3	1M	
	g)	State Heisenberg uncertainty principle	CO2,L1	1M	
	h)	Failures of classical free electron theory	CO3,L3	1M	
	i)	What are Lattice parameters.	CO3,L1	1M	
	j)	What is the main assumption of Kronig Penny model.	CO3,L1	1M	
	k)	State bragg's law	CO4,L1	1M	
	l)	Properties of ultrasonic waves.	CO4,L1	1M	
	m)	Define NDT.	CO4,L2	1M	
	n)	Mention the applications of radio isotopes.		1M	
		UNIT I			
2.	a)	Explain in detail the Principle, construction and working of He-Ne laser with its merits.	CO1,L1	10M	
	b)	Differentiate spontaneous and stimulated emission	CO1,L2	4M	
		(OR)			
3.	a)	Derive an expression for the acceptance angle and numerical aperture in an optical fiber	CO1,L3	10M	
	b)	Short note on Fibre optic communication system	CO1,L2	4M	
		UNIT II			
4.	a)	Derive schroedinger time independent wave equation	CO2,L1	8M	
	b)	Explain Davission and Germer experiment for the existence of wave nature of electrons.	CO2,L2	6M	
		(OR)			
5.	a)	Derive Schroedinger equation for the particle in an one dimensional box. And deduce for y and z axis.	CO2,L3	8M	
	b)	Explain the construction of scanning tunnelling microscope	CO2,L2	6M	
		UNIT III			
6.	a)	Explain the formation of energy band gap using Kronig Penny model..	CO3,L1	10M	
	b)	Derive an expression for effective mass of an electron.	CO3,L2	4M	
		(OR)			
7.	a)	With the construction explain the working of X-ray powder diffraction method.	CO3,L2	10M	
	b)	State and explain Bragg's law.	CO3,L1	4M	
		UNIT IV			
8.	a)	Mention the applications of ultrasonic waves.	CO4,L2	7M	
	b)	Explain Principle, construction and Working of Magnetostriction electric generator in producing ultrasonic	CO4,L1	7M	
		(OR)			
9.	a)	Explain the scanning methods in NDT	CO4,L1	7M	
	b)	Mention the properties of α,β,γ-rays	CO4,L3	7M	

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Hall Ticket Number:

I/IV B.Tech (Regular) DEGREE EXAMINATION

April, 2022 — **Common to CE and ME**

First Semester — **Advanced Optics and Material Testing**

Time: Three Hours — **Maximum:70** Marks

*Answer **Question NO. 1** compulsorily.* (14X1 = 14 Marks)

*Answer **ONE** questions from each unit.* (4X14=56 Marks)

			M	CO	BL	
1.	a)	What is the ratio of He and Ne mixture in He-Ne laser?		**CO1**		
	b)	Define population inversion in laser.		**CO1**		
	c)	Give the principle of an optical fiber		**CO1**		
	d)	Define numerical aperture in optical fiber.		**CO1**		
	e)	Give the expression for energy of particle in potential box.		**CO2**		
	f)	What are matter waves?		**CO2**		
	g)	Give two physical significance of wave function.		**CO2**		
	h)	State Heisenberg uncertainty principle		**CO2**		
	i)	Failures of classical free electron theory		**CO3**		
	j)	What are lattice parameters?		**CO3**		
	k)	Classify sound with respect to frequency.		**CO4**		
	l)	State bragg's law		**CO3**		
	m)	List two properties of ultrasonic.		**CO4**		
	n)	Define NDT.		**CO4**		
		UNIT I				
2.	a)	Distinguish between Spontaneous and stimulated emission	**10M**	**CO1**		
	b)	Explain with a neat diagram the principle, construction and working of a semiconductor laser.	**4M**	**CO1**		
		(OR)				
3.	a)	Explain in detail the Principle, construction and working of He-Ne laser.	**10M**	**CO1**		
	b)	Differentiate spontaneous and stimulated emission	**4M**	**CO1**		
		(OR)				
4.	a)	Classification of an optical fibre based on modes and refractive index	**10M**	**CO2**		
	b)	Short notes on the losses of an optical fiber	**4M**	**CO2**		
		UNIT II				
5.	a)	Derive schroedinger time independent wave equation	**4M**	**CO2**		
	b)	Explain the debroglie's concept of matter waves and give wavelength.	**10M**	**CO2**		
		(OR)				
6.	a)	Explain the significance of a wavefunction	**4M**	**CO3**		
	b)	Derive Schroedinger equation for the particle in an one dimensional box.	**10M**	**CO3**		
		UNIT III				
7.	a)	Derive an expression for effective mass of an electron.	**10M**	**CO3**		
	b)	Explain the formation of energy bands using Kronig-Penny model.	**4M**	**CO3**		
		(OR)				
8.	a)	Explain how the structure of crystal will be determined by powder method with neat diagram.	**4M**	**CO4**		
	b)	Draw the Miller planes for (111), (001)	**10M**	**CO4**		
		UNIT IV				
9.	a)	Mention the applications of ultrasonics.	**4M**	**CO4**		
	b)	Explain Principle, construction and Working of Magnetostriction generator in producing ultrasonic	**10M**	**CO4**		

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Hall Ticket Number:

I/IV B.Tech (Regular) DEGREE EXAMINATION

JULY, 2021 — **Common to CE and ME**

First Semester — **Advanced Optics and Material Testing**

Time: Three Hours — **Maximum:70** Marks

*Answer **Question NO. 1** compulsorily.* (14X1 = 14 Marks)

*Answer **ONE** questions from each unit.* (4X14=56 Marks)

			M	CO	BL	
1.	a)	What is population inversion?		**CO1**		
	b)	What are the characteristics of LASER?		**CO1**		
	c)	An optical fibre has an acceptance angle 26.80^0. Calculate its numerical aperture.		**CO1**		
	d)	Write any two advantages of optical fibres.		**CO1**		
	e)	Calculate the energy required for an electron to jump from ground state to first exited state in a potential well of width L,		**CO2**		
	f)	What are the properties of matter waves?		**CO2**		
	g)	Calculate de Broglie wave length of an electron moving with a potential of 64V.		**CO2**		
	h)	Define Effective mass of electron?		**CO3**		
	i)	What are Drawbacks of quantum free electron theory?		**CO3**		
	j)	Draw the crystal planes of (111), and (100).		**CO3**		
	k)	State Bragg's Law.		**CO3**		
	l)	What are ultrasonics?		**CO4**		
	m)	What is meant by Non-destructive testing?		**CO4**		
	n)	What are α ,β ,γ rays?		**CO4**		
		UNIT I				
2.	a)	Distinguish between Spontaneous and stimulated emission	**6M**	**CO1**		
	b)	Explain with a neat diagram the principle, construction and working of a semiconductor laser.	**8M**	**CO1**		
		(OR)				
3.	a)	Derive an expression for acceptance angle and numerical aperture for an optical fibre.	**6M**	**CO1**		
	b)	Explain optical fibre communication with neat block diagram and also explain optical transmission losses in optical fibres.	**8M**	**CO1**		
		UNIT II				
4.	a)	Derive time independent Schrodinger equation.	**7M**	**CO2**		
	b)	Explain Heisenberg uncertainty principle, based on this, show the non-existence of electrons inside the nucleus.	**7M**	**CO2**		
		(OR)				
5.	a)	Calculate the wave lengths of electron using Bragg law and de Broglie hypothesis using the data as obtained in the Davission and Germer experiment.	**10M**	**CO2**		
	b)	Explain the physical significance of wave function ψ.	**4M**	**CO2**		
		UNIT III				
6.	a)	Explain the 'Kronig-penny' model of solids and show that it leads to energy band structure of solids.	**10M**	**CO3**		
	b)	Write any four drawbacks of the classical free electron theory of metals.	**4M**	**CO3**		
		(OR)				
7.	a)	What are miller indices? How are they obtained	**6M**	**CO3**		
	b)	Describe the seven crystal systems with diagrams.	**8M**	**CO3**		
		UNIT IV				
8.	a)	With a neat diagram explain the production of ultrasonic waves by piezo electric oscillator method	**8M**	**CO4**		
	b)	List out the properties of ultrasonic waves	**6M**	**CO4**		
		(OR)				
9.	a)	What are Nuclear radio isotopes? Explain them.	**7M**	**CO4**		
	b)	Mention the applications of radio isotopes in medical and industry.	**7M**	**CO4**		