18PH002

Hall Ticket Number:

I/IV B. Tech. (Regular / Supplementary – Repeat Exam) DEGREE EXAMINATION

January, 2021 — **Civil and Mechanical Engineering**

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

Time: Three Hours — **Maximum :** 50 Marks

Answer ALL Questions from PART-A. (1X10 = 10 Marks)

*Answer **ANY FOUR** questions from PART-B.* (4X10 = 40 Marks)

Part - A

. (1X10 = 10 Marks)

		Marks	CO	BL
1	Answer all questions			
	a. Define population Inversion relating to laser action.	1 M	1	1
	b. Define numerical aperture of an optical fiber.	1 M	1	1
	c. What is the principle involved in optical fiber.	1 M	1	1
	d. What are matter waves?	1 M	2	1
	e. Determine the wavelength of an electron accelerated from rest through a potential difference of 100 volts.	1 M	2	3
	f. Define effective mass of an electron.	1 M	3	1
	g. State Bragg's law.	1 M	4	1
	h. Mention some of the general applications of Ultrasonic.	1 M	5	1
	i. What are Lattice parameters?	1 M	4	1
	j. What are Nuclear radio isotopes? Give examples.	1 M	5	1

Part - B

2.a	Describe the construction and working of Ruby laser with an energy level diagram	8 M	1	2
2.b	Mention the properties of laser light.	2 M	1	1
3.a	Derive an expression for the Acceptance Angle of a fiber using a neat diagram.	5 M	1	6
3.b	Draw the block diagram of Optical communication system and explain its function of each block.	5 M	1	4
4.a	Describe the experimental evidence for the existence of wave nature of electron with a neat diagram (Davisson-Germer experiment).	7 M	2	2
4.b	Using uncertainty principle, show that electrons cannot exist inside the nucleus.	3 M	2	3
5.a	Derive an expression for Schrodinger Time independent wave equation.	7 M	2	6
5.b	Write the physical significance of wave function.	3 M	2	2
6.a	Explain the formation of bands using Kronig Penny Model.	7 M	3	4
6.b	Mention some of the failures of Quantum free electron theory of solids.	3 M	3	1
7.a	Explain the structure of crystal using X-ray Powder Diffraction Method using a diagram.	7 M	4	4
7.b	Write the procedure for finding the Miller Indices of a plane	3 M	4	2
8.a	Mention some of the properties of Ultrasonic Waves.	3 M	5	1
8.b	Explain the production of ultrasonic waves using Magnetostriction method with a neat diagram.	7 M	5	4
9.a	Give any three Medical and Industrial applications (from each) of Radio Isotopes.	6 M	5	2
9.b	Distinguish between the properties of α, β and γ rays.	4 M	5	2