Register No.: …… Name: ……

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER B.TECH DEGREE EXAMINATION (Supplementary), December 2021

Course Code: **20PHT100**

Course Name: **Engineering Physics A**

Max. Marks: **100** **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

		CO
1.	Define the Q factor for a damped and a forced harmonic oscillator.	[1]
2.	Distinguish between transverse and longitudinal waves with examples.	[1]
3.	Explain the working of an antireflection coating.	[2]
4.	Differentiate grating spectra and prism spectra.	[2]
5.	The minimum uncertainty in the transition time of a particle from excited state to ground state is equal to 2 nanoseconds. What is the minimum uncertainty in the frequency of the particle?	[3]
6.	Explain any three applications of nanomaterials in real life.	[3]
7.	What is Gauss's law in magnetism? Write down its differential form.	[4]
8.	Write any three differences between conduction current and displacement current.	[4]
9.	What is a solar cell? Draw its I-V characteristics.	[5]
10.	Write any three advantages of fibre optic communication over conventional communication.	[5]

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

			CO	Marks
11.	a)	What is a damped harmonic oscillator? Derive the differential equation of a damped harmonic oscillator and obtain its solution. Discuss three cases of damping with displacement time graph.	[1]	(10)
	b)	The frequency of a tuning fork is 500 Hz and its Q factor is 7×10^4. Find the relaxation time and the damping constant.	[1]	(4)

OR

			CO	Marks
12.	a)	Derive the expressions for the velocity and fundamental frequency of a transverse wave along a stretched string.	[1]	(10)
	b)	The equation of a wave travelling in a string is given by $y=4\sin\pi(2x-40t)$ where x is in meters and t is in seconds. Evaluate the wavelength, frequency, time period and velocity of propagation.	[1]	(4)

MODULE II

			CO	Marks
13.	a)	With necessary diagram, write the formation of interference pattern in an air wedge and derive an expression for the diameter of a thin wire.	[2]	(10)
	b)	Newton's rings are formed with reflected light of wavelength 585 nm with a liquid between the plane and curved surfaces. The diameter of the 5^{th} dark ring is 0.3 cm and radius of curvature of the surface is 1 m. Calculate the refractive index of the liquid.	[2]	(4)

OR

			CO	Marks
14.	a)	What is Diffraction grating? Derive Grating equation. What is Rayleigh Criterion?	[2]	(10)
	b)	What is the highest order spectrum which may be obtained with a light of wavelength 6000 Å by means of a plane transmission grating having 50×10^4 lines/meter	[2]	(4)

MODULE III

			CO	Marks
15.	a)	What is normalization condition? What is its physical significance? Derive time dependent Schrodinger equation.	[3]	(10)
	b)	What is quantum mechanical tunneling? Give an example.	[3]	(4)

OR

			CO	Marks
16.	a)	What is quantum confinement? Compare the following nanostructures. (i) nano sheets (ii) nano wires (iii) quantum dots.	[3]	(10)
	b)	Explain the mechanical and electrical properties of nanomaterials	[3]	(4)

MODULE IV

			CO	Marks
17.	a)	Define the term magnetic induction. Distinguish dia, para and ferromagnetism. Give two examples for each.	[4]	(10)
	b)	Find the magnetization of a ferromagnetic material if a magnetic field strength of 200 Am^{-1} is applied. The relative permeability of the material is 16.5.	[4]	(4)

OR

			CO	Marks
18.	a)	Using Maxwell's equation in free space, arrive at the differential equation for electromagnetic wave propagation. Prove that light is an electromagnetic wave.	[4]	(10)
	b)	State and derive equation of continuity.	[4]	(4)

MODULE V

			CO	Marks
19.	a)	Distinguish type-I and type –II superconductors. Plot magnetization vs. magnetic field curves in both types. Mention any two applications of superconductors.	[5]	(10)
	b)	What is Meissner effect? Prove that superconductors are perfect diamagnetic materials	[5]	(4)

OR

			CO	Marks
20.	a)	Explain how light is propagated in a step index fibre. Derive the numerical aperture of a step index fibre. Mention any two medical applications of optical fibre.	[5]	(10)
	b)	An optical fibre has a core refractive index 1.54 and a cladding of 1.52. If the signal is launched from a liquid medium of refractive index 1.30, (i) what is the numerical aperture? (ii) what is the acceptance angle?	[5]	(4)

****