

Programme	: B. Tech.	Semester	: Winter Inter II / Winter Semester / Summer 2022-23
Course Title	: Engineering Physics	Course Code	: PHY1001
Time	: 3 Hrs.	Max. Marks	: 100

Answer ALL the Questions

Q. No.	Question Description	Marks
PART A – (60 Marks)		
1	(a) With the help of relevant equation of motion, distinguish the inertial and non-inertial frame of reference. Also, with the help of example, describe how we experience pseudo forces in day to day life.	12
	OR	
	(b) For a ring of radius 'R' and mass 'M', evaluate the moment of inertia (i) along the axis passing through the center (z-axis) and is perpendicular to plane of ring, and (ii) Along the axis which passes through the diameter.	12
2	(a) For a quantum particle confined between the space of length of 0 to 2L, estimate the mean position of particle in ground state.	12
	OR	
	(b) (i) A certain photon has a momentum of 1.50×10^{-27} kgm/s. What will be the photon's de-Broglie wavelength?	12
	(ii) What is the de-Broglie wavelength of an electron which is accelerated through a potential difference of 10kV?	
3	(a)	12
	OR	
	(b) Illustrate the utilization of nanotechnology in the water treatment.	12
4	(a) Describe the following for a semiconductor laser (i) Advantages (ii) Disadvantages (iii) Working principle	12
	OR	
	(b) Describe the operation of a three level and four level pumping schemes. Why four level pumping schemes is superior to three level.	12
5	(a) Write a short note on the utilization of fiber optics in communication and healthcare industry.	12
	OR	
	(b) Compute $\text{div } \mathbf{F}$ and $\text{curl } \mathbf{F}$ for $\mathbf{F} = (3x + z^2) \mathbf{i} + (x^3 y^2 z^{-1}) \mathbf{j} - (z - 7x) \mathbf{k}$	12

PART B – (40 Marks)

6 A mass of 6 kg rests on a rough horizontal plane. The coefficient of friction between the mass and the plane is $\mu=0.6$. Find the magnitude of the maximum force P which acts on the mass without causing it to move if the force P is horizontal. What is the force P acts at an angle of 75° above the horizontal. 8

7 Suppose the velocity of an electron in an atom is known to have an uncertainty of $2 \times 10^3 \text{ ms}^{-1}$ (reasonably accurate compared with orbital velocities). What is the electron's minimum uncertainty in position, and how does this compare with the approximate 0.1 nm size of the atom? 8

8 Describe the origin of the unique optical properties of the nanomaterials. 8

9 Describe the following in relation with LASER 8

(i) Spontaneous emission

(ii) Stimulated emission

(iii) Population inversion

(iv) Meta stable states

10 (i) An optic fiber of refractive index 1.50 is to be clad to ensure total internal reflection that will contain light traveling with in 5° of the fiber axis. What minimum refractive index is allowed for the cladding? 8

(ii) The angle of acceptance of an optical fiber is 30° when kept in air. Find the acceptance angle when the same fiber is immersed in water of refractive index 1.33

