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 **12**
(i) Advantages
(ii) Disadvantages
(iii) Working principle

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 div **F** and curl **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   8
the mass and the plane is μ=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.

7   Suppose the velocity of an electron in an atom is known to have an uncertainty of $2 \times$ 8
10^3 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   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   8
reflection that will contain light traveling with in 5° of the fiber axis. What minimum
refractive index is allowed for the cladding?

(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

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