

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, December 2025
B. Tech. , Semester I, 2025-26

Roll No.....

AS1108: Applied Physics

Time: 2:30 hours Max. Marks: 30

Notes:

- All questions are compulsory. **8 Questions are there.**
- Unless stated otherwise, the symbols have their usual meaning in context with subject..
- If any value or symbol or variable is missing please take the appropriate value mention it clearly and write your answer.
- Basic Scientific Calculator (without storage Memory) is allowed.
- **Planck const.= $6.62607015 \times 10^{-34}$; rest mass = 9.1×10^{-31} kg; reduce Planck const.= 1.054×10^{-34}**

Q1.	A beam of white light containing frequencies between 4.0×10^{14} Hz and 7.9×10^{14} Hz is incident on sodium surface, which has a work function 2.28 eV. a.) What is the range of frequencies in this beam of light for which electrons are ejected from the sodium surface? b.) Find the maximum kinetic energy of photoelectrons ejected from this surface.	³ (CO 1)
Q2.	You threw a ball vertically upward from the roof of a tall building. The ball leaves your hand at a point even with the roof railing with an upward speed of 15.0 m/s; the ball is then in free fall. (We ignore air resistance.) On its way back down, it just misses the railing. Find: (a) the ball's position and velocity 1.00 s and 4.00 s after leaving your hand. (b) the ball's velocity when it is 5.00 m above the railing. (c) the maximum height reached. (d) the ball's acceleration when it is at its maximum height.	⁴ (CO 1)

Q3.	A robotic vehicle, or rover, is exploring the surface of Mars. The stationary Mars lander is the origin of coordinates, and the surrounding Martian surface lies in the xy-plane. The rover, which we represent as a point, has x- and y-coordinates that vary with time: $x = 3 \text{ m} - 0.5 t^2 \text{ (m/s}^2\text{)}$ $y = 2t \text{ (m/s)} + 1.25 t^3 \text{ (m/s}^3\text{)}$ (a) Find the rover's coordinates and distance from the lander at $t = 2.5\text{s}$. (b) Find the rover's displacement and average velocity vectors for the interval $t = 0.0 \text{ s}$ to $t = 2.5 \text{ s}$. (c) Find a general expression for the rover's instantaneous velocity vector "$\mathbf{v}$".	3 (CO 2)
Q4.	A copper surface is irradiated with light of wavelength $1849\text{\AA}$, resulting in a stopping potential of 2.7V . Calculate the threshold frequency and work function for the copper surface.	3 (CO 2)
Q5.	Suppose a proton is confined to a box of width $L=1.001014\text{m}$. a) What are the energies in (eV) of the ground and the first excited states? b) If the proton makes a transition from the first excited state to the ground state, what are the energy and the frequency of the emitted photon?	4 (CO 2)
Q6.	An incident 71-pico meter X-ray is incident on a calcite target. Find the wavelength of the X-ray scattered at a 30° angle. What is the largest and smallest shift that can be expected in this experiment	3 (CO 3)
Q7.	Through what potential difference must electrons be accelerated if they are to have (a) the same wavelength as an x ray of wavelength 0.220 nm and (b) the same energy as the x ray in part (a)?	4 (CO 3)
Q8.	a) Find the electric potential produced by a point charge of $6.80 \times 10^{-7}\text{C}$ at a distance of 2.60m .	2.5 (CO 2)
	b) Calculate the magnitude of induced EMF if the magnetic field through a six turn coil increases at a rate of 0.17 T/s .	2.5 (CO 2)