SHAMBHUNATH INSTITUTEOF ENGINEERING AND TECHNOLOGY

Subject Code: BAS101 **Subject: Engineering Physics**

Course: B.Tech **SEMESTER: 1st semester**

FIRST SESSIONAL EXAMINATION, ODD SEMESTER, (2022-2023)

(For Sec E Only)

Time –1hr 30 min **Maximum Marks – 30**

SECTION – A

1. Attempt all questions in brief.

Q N	QUESTION	*Marks*	*CO*	*BL*
a.	Explain the failure of classical theory.	2	CO1	L1
b.	Explain the properties of matter.	2	CO1	L1
c.	Briefly discuss plank's radiation law.	2	CO1	L1
d.	Write Heisenberg's uncertainty principle.	2	CO1	L1

SECTION - B

2. Attempt any *ONE* of the following.

Q N	QUESTION	*Marks*	*CO*	*BL*
a.	Derive time independent Schrödinger wave equation. Write significance and properties of wave function.	5	CO1	L4
b.	What is Compton's effect? Derive expression for Compton's shift. Why Compton's shift is not observed in visible light?	5	CO1	L4

3. Attempt any *ONE* of the following.

a.	Describe the Davisson & Germer experiment to demonstrate the wave nature of electrons.	5	CO1	L2
b.	Show that de-Broglie wave group associated with a moving particles travels with same velocity as the particle i.e. $v_g = v$.	5	CO1	L3

SECTION - C

4. Attempt any *ONE* part of the following:

Q N	QUESTION	Marks	CO	BL
a.	(i). Define group velocity and phase velocity. Also prove that $v_g = v_p - \lambda \frac{dV_p}{d\lambda}$	3	CO1	L6
	(ii). What is the wavelength of a α-particle which has been accelerated from rest through a potential difference of 200V?	3		L5
b.	A particle is moving in one dimensional box of length L described by **U=0 for 0< x< L** **U = ∞ for x ‹ 0 and x › L** Write and solve its Schrödinger's wave equation and obtain ***Eigen value and Eigen function.*** Prove that energy of the matter particle is in *quantized* form.	6	CO1	L3

5. Attempt any *ONE* part of the following:

Q N	QUESTION	Marks	CO	BL
a.	An electron is confined to move between two rigid walls separated by 10^{-9}m.find the de-Broglie wavelength representing the first three allowed energy states of the electron and corresponding energies.	6	CO1	L5
b.	An X-ray photon is found to have its wavelength doubled on being scattered through 90^0 .find the wavelength and energy of the incident photon.	6	CO2	L5

Constants: **Mass of proton** $= 1.67 \times 10^{-27}$ kg.
Mass of electron $= 9.1 \times 10^{-31}$ kg.
Charge of proton $= 1.6 \times 10^{-19}$ C.
Planck's constant h $= 6.625 \times 10^{-34}$ J-sec.
Velocity of light $= 3 \times 10^{8}$ m/s.

Bloom's Taxonomy Level (BL) :-
Remember (L1), Understanding (L2), Apply (L3), Analyze (L4), Evaluating (L5), Creating (L6)