UUCMS No.

B.M.S COLLEGE FOR WOMEN
BENGALURU – 560004

V SEMESTER END EXAMINATION – JAN/FEB - 2024

B.Sc – PHYSICS - CLASSICAL MECHANICS AND QUANTUM MECHANICS – 1
(NEP Scheme 2021-22 onwards)

Course Code: PHY5DSC05 **QP Code: 5020**
Duration: 2 ½ Hours **Max. Marks: 60**

Instructions: Answer any FOUR questions from each part

PART - A

I. Answer any FOUR questions out of SIX. Each question carries 8 marks. (4X8=32)

1. a) What are conservative forces? Give an example.
   b) Obtain the Lagrangian and equation of motion for a simple pendulum. (2 + 6)
2. a) Derive an expression for length contraction.
   b) Mention the significance of Michelson – Morley experiment. (6 + 2)
3. Prove $E = mc^2$ and write its significance. (8)
4. a) Explain the failure of classical mechanics to explain photoelectric effect.
   b) What is an operator? Define linear momentum and parity operator. (4 + 4)
5. a) Describe Davisson- Germer experiment to show the existence of a de-Broglie waves.
   b) How is a wave packet formed? (6 + 2)
6. Derive time – independent Schrodinger wave equation. (8)

PART - B

II. Answer any FOUR problems out of SIX. Each question carries 5 marks. (4X5=20)

7. A constant force $F = (6\,i + 8j)$ N acts on a particle and undergoes a displacement $S = (2i – 5j)$. Calculate the work done by the force.
8. A particle of rest mass m_0 moves with a speed0.6c. Calculate its mass, momentum, total energy and kinetic energy.
9. With what velocity should a spaceship move, so that everyday spent on it may correspond to 4 days on the surface of earth?
10. Calculate the frequency and energy in eV of photon of wavelength 400nm.
11. A microscope using photons is employed to locate an electron in an atom within a distance of $0.1A^o$. Calculate the uncertainty in momentum of the electron located.
12. Calculate the zero point energy and spacing of energy levels in one dimensional oscillator of

frequency 2 KHz.

PART - C

III. Answer any FOUR questions out of SIX. Each question carries 2 marks. (4X2=8)

13. Is rotating frame inertial? Explain.
14. Is speed of light invariant in Special theory of relativity? Explain.
15. Mention any two types of constraints.
16. Is electromagnetic radiation wave or a particle?
17. Can matter waves travel faster than light? Explain
18. What are quantized states? Explain.

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