

Total No. of Printed Pages: 3

**SUBJECT CODE NO:- Y-2011**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. (PATTERN-2013) T.Y (SEM-V)**  
**Examination April / May - 2024**  
**Physics Paper-XV (Classical & Quantum Mechanics)**

[Time: 1:30 Hours]

[Max. Marks: 50]

Please check whether you have got the right question paper.

N. B                      1) All questions are compulsory.

Given Data

$$K = 1.38 \times 10^{-23} \text{ J/K}$$

$$h = 6.63 \times 10^{-34} \text{ Js}$$

$$R = 8.31 \times 10^3 \text{ J/kmol K}$$

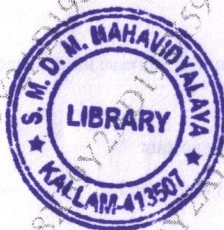
$$m_e = 9.1 \times 10^{-31} \text{ kg}$$

$$N_0 = 4\pi \times 10^{-7} \text{ wb/Amp}$$

$$e = 1.6 \times 10^{-19} \text{ C}$$

$$C = 3 \times 10^8 \text{ m/s}$$

$$1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$$



- Q.1** a) Derive an expression of Lagrange's equation. 10  
 b) Obtain an expression of plank's radiation law. Deduce wien's law from plank's law. 10

OR

- a) Explain in details Davisson and Germer's experiment on diffraction of electron. 10  
 b) Derive time independent form of Schrodinger's equation 10

- Q.2** A) Explain the principle of Virtual work. 5

B) Write a note on At wood's machine. 5C) Apply uncertainty principle to explain binding energy of an electron in an atom. 5D) Calculate the De-Broglie wavelength associated with an electron of energy sev. 5

OR

A) Discuss linear momentum of photon in terms of wave vector. 5B) Find the threshold wavelength for tungsten surface whose work function is 3ev. 5C) Write a note on operator value. 5D) Calculate the permitted energy level of election in a box of 2 A° wide. 5

## Q.3 Multiple choice question.

1) Equation of motion of simple pendulum is -----

- a)  $\theta + \frac{g}{l} \sin \theta = 0$       b)  $\theta + \frac{l}{g} \sin \theta = 0$   
 c)  $\theta + \frac{g}{l} \sin \theta = 0$       d)  $\theta + \frac{l}{g} \sin \theta = 0$

2) The rate of change of angular momentum is -----

- a) moment of Inertia      b) Torque  
 c) moment of momentum      d) None of these

3) In blackbody radiation spectrum as increase in temperature wavelength at maximum emission

- a) Increase      b) constant  
 c) Decrease      d) Both a and c

4) which of the following phenomenon supports the quantum nature of light \_\_\_\_\_

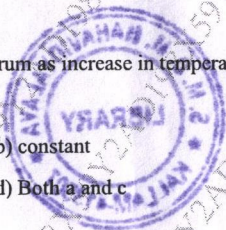
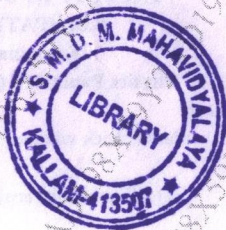
- a) Interference      b) Diffraction  
 c) Polarisation      d) Compton effect

5) Which of the following is correct statement of Heisenberg uncertainty principle.

- a)  $\Delta p \cdot \Delta x \geq \hbar$       b)  $\Delta \epsilon \cdot \Delta \theta \geq \hbar$   
 c)  $\Delta \epsilon \cdot \Delta t \geq \hbar$       d) All these correct

6) The group velocity  $V_g$  of the equation

- a)  $\frac{\Delta k}{\Delta \omega}$       b)  $\Delta W \cdot \Delta K$   
 c)  $\frac{\Delta \omega}{\Delta k}$       d) All these correct





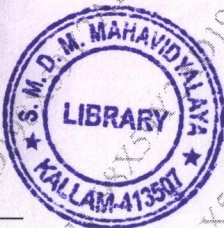
7) Probability density is \_\_\_\_\_

a)  $P = |\varphi|^2$

b)  $P = |\varphi|$

c)  $P = \left| \frac{\varphi}{2} \right|$

d)  $P = \left| \frac{\varphi^2}{2} \right|$



8) The energies of particle in box are \_\_\_\_\_

a) discrete energies

b) continuous energies

c) only single value of energies

d) all of these.

9) The concept of duality is firstly proposed by \_\_\_\_\_

a) Einstein

b) E. P. Thomson

c) Devisson

d) De- Broglies

10) The potential energy of particle in a one dimension box is \_\_\_\_\_

a)  $\infty$

b) 0

c) 1

d) None of these.