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SUBJECT CODE NO:- B-2011
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. T.Y. (Sem-V) Examination Oct/Nov 2019
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.
$K = 1.38 \times 10^{-23} \, J/K$
$R = 8.31 \times 10^{3} J/kmole \, k$
$\mu_0 = 4\pi \times 10^{-7} \, wb / Amp$
$C = 3 \times 10^{8} \, m/s$
$h = 6.63 \times 10^{-34} J - S$
$m = 9.1 \times 10^{-31} kg$
$e = 1.6 \times 10^{-19} C$
$1ev = 1.6 \times 10^{-19} J$

Q.1	a)	What are constraints? Explain Holonomic and Non – Holonomic constraints with examples.	10
	b)	What is Compton Effect? Derive an expression for Compton shift.	10

OR

	a)	State Heisenberg's Uncertainty Principle. Obtain it for the potion momentum uncertainty.	10
	b)	Derive time dependent form of Schrodinger's wave equation.	10

Q.2	a)	Obtain an equation for motion of simple pendulum using Lagrange's equation.	05
	b)	In a Atwood machine two blocks of masses m_1 and m_2 are attached at the ends of the string find the acceleration of the blocks and tension in the string.	05
	c)	Using uncertainty principle show that electron does not exist inside the nucleus.	05
	d)	The average period that elapses between. The excitation of an atom and the time it emits radiation is $10^{-8} sec$. Find uncertainty in the energy emitted.	05

OR

	a)	Discuss Linear momentum of photon in terms of wave vector.	05
	b)	Calculate the work function in ev for a metal having threshold wavelength $6800 A°$.	05
	c)	What are operators? Obtain momentum and energy of operator.	05
	d)	Calculate the value of lowest energy of an electron in one dimensional force. Free region of length $3 A°$.	05

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Q.3   Multiple choice questions.   10

1) Atwood machine is an example of ____system.
   a) Linear   b) Angular   c) Conservative   d) None of these

2) Equation of motion of simple pendulum is
   a) $\theta + \frac{g}{l} \sin\theta = 0$

   b) $\ddot{\theta} + \frac{g}{l} \sin\theta$

   c) $\ddot{\theta} + \frac{l}{g} \sin\theta = 0$

   d) $\theta + \frac{l}{g} \sin\theta = 0$

3) For shorter wavelength which Law holds?
   a) Ray leigh – Jeans law   b) Einstein's law
   c) Planck's law   d) Wein's law

4) In black body radiation area under curve or total energy is directly proportional to
   ____power of temperature.
   a) 4th b) 5th c) 2nd d) 6th

5) In Davisson Germer experiment. The order of spectrum is proportional to
   a) $\sqrt{V}$ b) $\sqrt{V^2}$ c) $\sqrt{V/2}$ d) $\sqrt{V^3}$

6) The de Broglie wavelength λ of an electron in n^{th} Bohr orbit is related to radius r of the orbit is
   a) $n\lambda = \pi r$ b) $n\lambda = 2\pi r$ c) $n\lambda = 4\pi r$ d) $n\lambda = \frac{3}{2}\pi r$

7) The electron beam of wavelength $4.35 \times 10^{-7} m$ have energy as
   a) $4.566 \times 10^{-34} J$ b) $4.566 \times 10^{-17} J$
   c) $4.566 \times 10^{-19} J$ d) $4.566 \times 10^{-24} J$

8) For a stationary state the probability density is
   a) Function of time   b) Independent of space co –ordinates
   c) Independent of time   d) None of these

9) Which function will be normalized if
   a) $\int \Psi^*\Psi dv = 1$ b) $\Psi^*\Psi dv = 0$
   c) $\int \Psi^*\Psi dv = -1$ d) $\int \Psi^*\Psi dv = \infty$

10) Schrodinger wave equation for a moving particle contain.
   a) First order time derivative
   b) second order time derivative
   c) third order time derivation
   d) forth order time derivative

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