Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III • EXAMINATION – WINTER • 2014

Subject Code: 133503 **Date: 30-12-2014**

Subject Name: Applied Physics

Time: 02.30 pm - 05.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Useful constants: $h = 6.626 \times 10^{-34}$ Js, $m_e = 9.1 \times 10^{-31}$ kg, $c = 3 \times 10^{8}$ m/s, $e = 1.6 \times 10^{-19}$ C

Q.1	**(a)**	In Compton effect, considering the elastic collision between a photon and a free electron, write down equations of energy and momentum conservation.	**07**
	(b)	Define the de-Broglie concept of matter waves. Describe an experiment to show that the electrons in motion exhibit wavelike properties.	**07**
Q.2	**(a)**	(i) Derive an expression of energy for a particle in a finite potential well.	**04**
		(ii) Write the properties of a wave function.	**03**
	(b)	Derive the general expression of time independent Schrödinger wave equation in 3 dimensions. Describe all the notations used.	**07**
		OR	
	(b)	(i) Write the characteristics of photoelectric effect.	**04**
		(ii) Define work function, threshold frequency and photosensitive material.	**03**
Q.3	**(a)**	(i) Draw a block diagram of Cathode Ray Tube. Write any two applications of Cathode Ray Oscilloscope.	**05**
		(ii) What is Lorentz force? Write down its mathematical expression.	**02**
	(b)	(i) Describe the Thomson's method to determine e/m of electron.	**05**
		(ii) State the Faraday's law and Lenz's law of electromagnetic induction.	**02**
		OR	
Q.3	**(a)**	Discuss in detail the motion of an electron in uniform magnetic field.	**07**
	(b)	Explain with neat diagram the principle, construction and working of cyclotron.	**07**
Q.4	**(a)**	Describe principle, working and construction of the Bainbridge mass spectrograph.	**07**
	(b)	Explain the physical characteristics of light particles.	**07**
		OR	
Q.4	**(a)**	Explain in detail the Kubleka-Munk color mixing laws.	**07**
	(b)	(i) Write a note on light source and illuminants with examples.	**05**
		(ii) Define a black body radiator.	**02**
Q.5	**(a)**	(i) Define luminosity, gloss, hue and color.	**04**
		(ii) Write a note on color temperature.	**03**
	(b)	Discuss and derive the expression for the Beer-Lambert-Bouguer law for dilute solutions. Mention the important limitations of this law.	**07**
		OR	
Q.5	**(a)**	(i) Define additive and subtractive color mixing.	**04**
		(ii) What are the three dimensions of the color?	**03**
	(b)	(i) Which three attributes are assigned to the color of any object?	**03**
		(ii) Write a note on molecular transitions and related spectroscopic techniques.	**04**

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