

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

- 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 Kubelka-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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