

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III • EXAMINATION – SUMMER 2013****Subject Code: 133503****Date: 29-05-2013****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.

- Q.1** (a) Write a short note on the photoelectric effect. Derive an expression of the photoelectric equation using Einstein's theory. **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) Write a note on the scientific instrumentation required for the measurement of the color. **07**
- (b) Describe the effect of transverse and longitudinal electric field on the motion of the charged particles. Obtain the expression for the linear deflection. **07**
- OR**
- (b) Derive the general expression of time independent Schrödinger wave equation in 3 dimensions. Describe all the notations used. **07**
- Q.3** (a) (i) Describe Bain bridge mass spectrograph and its working. **05**
- (ii) The path followed by a charged particle under the magnetic field alone would be _____ and in a crossed electric and magnetic field would be _____. **02**
- (b) (i) A rod PQ of length l moves with a uniform velocity v parallel to a long straight wire, carrying a current i . What is the *emf* induced across the two ends of the rod? **02**
- (ii) A fan blade of length $2a$ rotates with frequency f cycles per second perpendicular to the magnetic field B . Find the potential difference between the centre and the end of the blades. **02**
- (iii) Draw a neat diagram of the construction of CRO. **03**
- OR**
- Q.3** (a) (i) Write a short note on a light source and an illuminant with examples. **04**
- (ii) Write a short note on color rendering index with examples. **03**
- (b) (i) What is a black body radiator? **01**
- (ii) Explain - the color of the light emitted by a radiator depends on its temperature. **05**
- (iii) What does 65 mean in D65? **01**
- Q.4** (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) (i) An electron and a 150gm baseball are travelling at 220m/s measured to an accuracy of 0.065%. Calculate and compare uncertainty in position of each of the bodies. **04**
- (ii) Explain the physical significance of ℓ -function. **03**
- OR**
- Q.4** (a) Describe the color mixing laws in detail. **07**
- (b) Write a note on color matching in textile. **07**
- Q.5** (a) (i) Find the de Broglie wavelength of (i) an electron accelerated through a potential difference of 182 volts, and (ii) a 1 kg object moving with a speed of 1m/s. Comparing the results explain why the wave nature of matter is not more

apparent in daily observations.

- (ii) If the incident radiation is $1.372\text{\AA}$, find the wavelength of scattered radiation at angle of 30° and also the velocity of the recoiled electron. **03**
- (b)** (i) Describe the construction of cyclotron and explain its working. Why can it not be used to accelerate electrons to very high velocities? **05**
- (ii) Define Lorentz force. **01**
- (iii) Aston's mass spectrograph is used for _____. **01**

OR

- Q.5** **(a)** (i) What are the basic components of color perception? Define luminosity. **02**
- (ii) State the uncertainty principle. **01**
- (iii) Light of wavelength $3500\text{\AA}$ falls on a Potassium surface with work function 2.2 eV . Calculate (i) maximum energy of photoelectrons in electron volts (ii) threshold wavelength and (iii) stopping potential. **04**
- (b)** (i) What is magnetic focusing? Write its application in mass spectrograph. **03**
- (ii) Describe the characteristic properties of light particles. **04**
