



**KC-6009**  
**B. E. - I (Sem. I & II) Examination**  
**November/December – 2012**  
**Engg. Physics**

Time : 3 Hours]

[Total Marks : 100

**Instruction :**

<p>नीचे दर्शावेक निशानीवाणी विगतो उत्तरवडी पर अवश्य कपवी. Fillup strictly the details of signs on your answer book.</p> <p>Name of the Examination : B. E. - I (Sem. I &amp; II)</p> <p>Name of the Subject : Engg. Physics</p> <p>Subject Code No. : 6 0 0 9 Section No. (1, 2,.....): Nil</p>	<p>Seat No. : [ ][ ][ ][ ][ ][ ][ ]</p> <p style="text-align: center;">Student's Signature</p>
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- 1 (a) Write the answer in short : 10
- (i) What is the full form of the word LASER ?
  - (ii) What is the condition of diffraction ?
  - (iii) State the types of coherence.
  - (iv) What is stimulated emission ?
  - (v) What is Ruby ?
  - (vi) Define the path difference.
  - (vii) State important characteristics of Laser.
  - (viii) Define the resolving power of grating.
  - (ix) What are basic concepts of laser ?
  - (x) State Malu's law for the plane polarized light.
- (b) Answer any two questions from the following : 12
- (i) Explain the application of Laser in detail.
  - (ii) Explain the construction and working of Michelson's interferometer.
  - (iii) Explain the term coherence, non coherence spatial coherence and temporal coherence.

- 2 (a) Answer any one question from the following : 6
- (i) Explain the construction and working of He-Ne laser.
- (ii) Explain the following terms : Populations inversion and optical pumping.
- (b) Solve any one from the following : 4
- (i) The ratio of population of two energy level out of which upper one corresponding to meta stable state  $1.06 \times 10^{-30}$ . Find the wavelength of light emitted at temperature  $T = 330^\circ \text{ K}$ .
- (ii) Find the ratio of population of two energy states of Ruby laser, the transition between which is responsible for the emission of photons of wavelength  $6928 \text{ \AA}$ . Assume the temperate is  $18^\circ \text{ K}$ .
- 3 (a) Answer any two from the following : 12
- (i) Explain the formation of Newton's rings. Show that the radii of successive rings are proportional to the square root of natural number of the rings.
- (ii) Discuss the colours of the thin film using interference phenomenon.
- (iii) Explain the methods of production and detection of various types of polarized light.
- (b) Solve any two from the following : 6
- (i) In the experiment of Newton's rings the diameter of 10th dark ring changes from 1.75 cm to 1.4 cm when liquid is introduced between the lens and glass plate. Calculate the refractive indices of the liquid.
- (ii) Two coherent sources of monochromatic light of wavelength  $6000 \text{ \AA}$ . Produce an interference pattern on a screen kept at a distance of 200 mm from them. The distance between two consecutive bright fringes on the screen is 1.5 mm, find the distance between the two coherent sources.
- (iii) Calculate the minimum number of lines in a grating which will just resolve the sodium lines in the first order spectrum. The wavelengths are  $5890 \text{ \AA}$  and  $5896 \text{ \AA}$ .

- 4 (a) Write the answer in short : 10
- (i) Define black body.
  - (ii) State Ampere's law.
  - (iii) Write Stefan's fourth power law.
  - (iv) What do you mean by absorption and emission ?
  - (v) Define spectral radiance.
  - (vi) What is the Compton shift for scattering angle of  $\phi = 90^\circ$ .
  - (vii) Write the two units of strength of magnetic field.
  - (viii) What is the main use of Hall effect ?
  - (ix) What will be the wavelength associated with electron moving with velocity  $10^7$  m/s ?
  - (x) State Bragg's equation for X-ray diffraction.
- (b) Answer any two questions from the following : 12
- (i) Explain construction and working of cyclotron.
  - (ii) Explain Hydrogen atom spectrum.
  - (iii) State and prove Ampere's theorem and explain any one application.
- 5 (a) Answer any one question from the following : 6
- (i) What do you mean by Hall effect set up the expression for Hall electric field  $E_H$  and Hall coefficient  $R_H$ .
  - (ii) Classify the magnetic materials from their magnetic properties and mention their magnetic behaviours.
- (b) Solve any one from the following : 4
- (i) Calculate magnetic induction (B) at interior point  $r = 80$  cm of a toroid having windings of 800 turns and current 5000 mA.
  - (ii) A monovalent metal strip 1 cm wide and 0.5 cm thick is placed in the magnetic field of  $B = 1.2$  tesla. If current of 50 Amp is set up in the strip, what Hall potential difference appears across the strip ? ( $n = 8.4 \times 10^{28}$ ).
- 6 (a) Answer any two from the following : 12
- (i) Explain the main features of photoelectric effect and also obtain Einstein's photoelectric equation.

- (ii) Define Matter waves. Discuss the De-Broglie hypothesis for the matter wave.
- (iii) State and derive Bragg's X-ray diffraction equation for the crystal lattice.

(b) Solve any two from the following :

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- (i) A mass spring system has mass  $M = 1.5$  kg and spring constant  $K = 20$  N/m and is oscillating with an amplitude of 1.0 cm. If energy is quantized, what is the quantum number ?
- (ii) Photoelectric threshold of a metallic silver 1.1 eV. Determine whether the metal shows photoelectric effect for the wavelength  $5800 \text{ \AA}$ .
- (iii) X-ray with  $\lambda = 1 \times 10^{-8}$  cm are scattered from carbon block. The scattered radiation is viewed at  $60^\circ$  to the incident beam. What is the Compton's shift ?

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