

**BE - 201**  
**B.E. I & II Semester Examination, December 2012**  
**Engineering Physics**  
**(Grading System)**

*Time : Three Hours*

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**Maximum Marks : 70**

**Note :** 1. Attempt five questions in all selecting one question from each unit.  
 2. All questions carry equal marks.

**Unit - I**

1. a) Explain the concept of wave packet and give Mathematical proof of Heisenberg's uncertainty relation between energy and time. 7
- b) Write shrodinger time dependent and Time Independent wave equation. Explain its physical significance and discuss the term in equation which is related with physical problem. 7

OR

2. a) An electron is confined in one dimensional square well of length  $0.4 \times 10^{-9}$  m. Find the energy of particle when its Eigen function has four antinodes and show that the particle can never have energy equal to 800 eV. [Given  $h = 6.63 \times 10^{-34}$  J sec,  $m = 9.13 \times 10^{-31}$  kg]. 6
- b) Derive an expression of kinetic energy of recoil electron in compton scattering. Why compton scattering is observed in x-rays, not in visible light waves. 8

**Unit - II**

3. a) Describe Fresnel Biprism. Discuss the effect of introducing thin mica sheet in the path of one of the interfering beams in a experiment. Deduce the expression for displacement of fringes. 10
- b) In a Newton's ring experiment the diameter of 5<sup>th</sup> dark ring is reduced to half of its value after placing a liquid between plane. Glass plate and convex surface. Calculate the refractive index of liquid. 4

OR

4. a) Give construction and theory of plane transmission grating. Obtain an expression for resolving power of plane transmission grating. **RGPVONLINE.COM** 10
- b) For a calcite,  $\mu_o = 1.658$  and  $\mu_e = 1.486$  for sodium light of  $\lambda = 5893 \text{ \AA}$ . Calculate the minimum thickness of quarter wave plate for calcite. 4

**Unit - III**

5. a) Mention salient features of liquid drop model and explain various terms given in Bethe-Weizsacker semi-empirical mass formula. 10
- b) Give applications and limitations of GM counter. **RGPVONLINE.COM** 4

OR

6. a) Give construction and working of Bainbridge mass spectrograph. If two isotopes of an element with mass  $m_1$  and  $m_2$  enters the mass spectrograph, what will be the ratio of the radii of their paths. 10
- b) A cyclotron has magnetic field of  $2 \times 10^4$  Gauss and radius of 85 cm. Calculate frequencies of the alternating electric field that must be applied and to what energy proton and electron can be accelerated.

[1 amv =  $1.67 \times 10^{-27}$  kg,  $e = 1.6 \times 10^{-19}$  C]

4

**Unit - IV**

7. Draw periodic potential observed by an electron. Moving in one dimensional crystal lattice. Discuss Kronig-Penney model proposed for periodic potential. Write shrodinger wave equation for such potential and discuss its solution. **RGPVONLINE.COM** 14

OR

8. a) What is Hall effect? Deduce an expression for Hall coefficient of a solid and describe method for its determination experimentally. What important informations are obtained from its measurements? 10
- b) A current of 1 A flows in a copper strip of length 10 cm and width. 5 cm. along its length. The strip is placed in a magnetic field of strength  $3 \times 10^{-6}$  weber/m<sup>2</sup> perpendicular to its length. If  $R_H = 0.55 \times 10^{10}$  volt-m<sup>3</sup>/ampere weber, find the Hall voltage developed in it. 4

**Unit - V**

9. a) Differentiate between spontaneous and stimulated emission. 4
- b) How laser light is different from ordinary light? Discuss the construction and working of HeNe laser or CO<sub>2</sub> laser. Write any two characteristics of these lasers. 10

OR

10. a) Derive an expression for ray dispersion in multimode step index fibers. 6
- b) Discuss the attenuation and dispersion in optical fibre. 4
- c) Define and explain following terms for an optical fibre. 4
  - i) Propagating modes.
  - ii) Normalized frequency.