Printed Pages : 2 **AS-202(C)**

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 1213 Roll No. | | | | | | | | | | |

B. Tech.

(For CS/IT)

(Semester II) Even Semester Theory Examination, 2012-13

ENGINEERING PHYSICS–II(C)

Time : 3 Hours] *[Total Marks : 80*

Note : Attempt questions from each Section as per instructions.

Section-A

Attempt *all* parts of this question. Each part carries 2 marks. 2×8=16

1. (a) What do you understand by wave packet?
   (b) Explain, why electron can not reside inside nucleus?
   (c) What is Meissner effect?
   (d) What is dielectric loss?
   (e) What do you mean by coercivity?
   (f) What is the importance of Hall effect?
   (g) Explain the photovoltaic effect.
   (h) What is image processing?

Section-B

Attempt any *three* parts of this question. Each part carries 8 marks. 8×3=24

2. (a) Calculate the de-Broglie wavelength associated with a proton moving with a velocity equal to one twentieth of the velocity of light.
   (b) The critical fields at 6K and 8K for NbTi alloys are 7.616 and 4.284 MA/m respectively. Calculate the transition temperature and the critical field at 0 K.
   (c) Calculate the electronic polarizability of argon atom at NTP, the dielectric constant of argon is 1.0024 and its atomic density is 2.7×10^{25} atoms/rn^3.
   (d) An iron rod 20 cm long, 1cm in diameter and of a permeability 1,000 is placed inside a solenoid, 1 meter long wound uniformly with 600 turns . If the current of 0.5 ampere is passed through the solenoid, find the magnetic moment of the rod.
   (e) There are about 2.5×10^{28} free electrons/m^3 in sodium. Calculate its Fermi energy, Fermi velocity and Fermi temperature.

P. T. O.

Section-C

Attempt *all* questions of this Section. Each question carries 8 marks. 8×5=40

3. Attempt any one part of the following :
   (a) What are phase and group velocity? Establish a relation between them in terms of frequency.
   (b) A particle is moving along a line between x=0 and x–a with zero potential energy. At point for which $x < 0$ and $x > a$, the potential energy is infinite. Solving Schrödinger'sequation, obtain the energy, eigenvalues and the normalized wave function for the particle.

4. Attempt any one part of the following :
   (a) What do you mean by superconductivity? Explain the BCS theory of super conductors and give some applications of super conductors.
   (b) What are non-omaterials? Discuss preparation technique and properties of Buckyball.

5. Attempt any one part of the following :
   (a) Discuss frequency dependence of dielectric constant. What is relaxation time?
   (b) What is diamagnetism? Show that susceptibility of diamagnetic material is negative and independent of temperature.

6. Attempt any one part of the following :
   (a) What is Fermi energy? Show how this energy depends on the density of electron gas.
   (b) What is Hall effect? Derive a relation between mobility and Hall coefficient.

7. Attempt any one part of the following :
   (a) Discuss the discrete Fourier transform and explain spatial filtering.
   (b) Explain the principle of holography. How this technique is useful to store the information.

Physical constants :

Speed of light	$c = 3.0\times10^{8}$ m/s
Planck's constant	$h = 6.62\times10^{-34}$ J-s
Mass of electron	$m = 9.1\times10^{-31}$ kg
Mass of proton	$m_p = 1.67\times10^{-27}$ kg
Permeability	$\mu_0 = 4\pi\times10^{-7}$ H/m
Permittivity	$\varepsilon_0 = 8.854\times10^{-12}$ F/m