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

PAPER ID : 1218 Roll No. | | | | | | | | | | |

B. Tech.

(For AU/BT/CE/CH/EV/FT/ME/MF/PE/TT/TX)

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

ENGINEERING PHYSICS–II(M)

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) Describe inter-planer spacing in crystal structure.
   (g) What is enthalpy?
   (h) What are thermisters?

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/rn. 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) Translation vectors of the unit cell of a crystal are 1.2 Å, 1.8 Å and 2.0 Å. A lattice plane (231) makes the intercept of length 1.2 Å on the *X*-axis. Find the length of the intercepts on *y* and *z* axis.

(e) The compressor of an air expansion machine intakes air at 1 atmosphere and releases at 5 atmosphere pressure. Calculate the coefficient of performance of the machine. If the power necessary to derive the machine is 1.5 H.P., fmd the amount of heat removed per minute. γ for air is 1.4.

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's equation, 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 superconductors.

(b) What are nonomaterials? 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 do you understand by space lattice? Describe the seven systems of crystals. Mention and explain with examples the types of lattices in a cubic system.

(b) Discuss Lau's principle of X-ray diffraction and obtain the diffraction condition for a simple cubic lattice.

7. Attempt any one part of the following :

(a) Explain the theory of Joule Thomson regenerative cooling. How can you obtain liquid helium by its application?

(b) Describe the working of a rotatory oil pump for producing low pressure. How are these pressure measured?

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