

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

PAPER ID : 1217

Roll No.

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B. Tech.

(For EC/EE/EN/EI/ET/EX/EL/IE/IC/IN)

(Semester II) Even Semester Theory Examination, 2012-13**ENGINEERING PHYSICS-II(E)****Time : 3 Hours]****[Total Marks : 80****Note :** Attempt questions from each Section as per instructions.**Section-A**

Attempt *all* parts of this question. Write answer of each part in short.. 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) What is enthalpy?
- (h) Define material dispersion.

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 3.284 MA/m respectively. Calculate the transition temperature and the critical field at 0K.
- (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/m³.
- (d) 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., find the amount of heat removed per minute. γ for air is 1.4.

- (e) A glass clad fiber is made with the core glass of refractive index 1.5 and the cladding is doped to give a fractional index difference of 0.005. Calculate (i) the refractive index of cladding, (ii) the critical angle, (iii) the acceptance angle, and (iv) the Numerical Aperture.

Section-C

Attempt *all* questions of this Section. Each question carries 10 marks. $8 \times 5 = 40$

3. Attempt any *one* part of the following :
- What are phase and group velocity? Establish a relation between them in term of frequency.
 - 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 :
- What do you mean by superconductivity? Explain the BCS theory of super conductors and give some applications of super conductors.
 - What are nano materials? Discuss preparation technique and properties of Buckyball.
5. Attempt any *one* part of the following :
- Discuss frequency dependence of dielectric constant. What is relaxation time?
 - What is diamagnetism? Show that susceptibility of diamagnetic material is negative and independent of temperature.
6. Attempt any *one* part of the following :
- What is Fermi energy? Show how this energy depends on the density of electron gas.
 - Explain the theory of Joule-Thomson regenerative cooling. How can you obtain liquid helium by its application?
7. Attempt any *one* part of the following :
- Describe the working of a rotatory oil pump for producing low pressure. How are these pressure measured?
 - What are optical fibers? Describe classification of these fibers with refractive index profile.

Physical Constants :

$$\begin{array}{ll} \text{Speed of light } c = 3.0 \times 10^8 \text{ m/s,} & \text{Planck's constant } h = 6.62 \times 10^{-34} \text{ J-s} \\ \text{Mass of electron } m = 9.1 \times 10^{-31} \text{ kg,} & \text{Mass of proton } m_p = 1.67 \times 10^{-27} \text{ kg.} \\ \text{Permeability } \mu_0 = 4\pi \times 10^{-7} \text{ H/m,} & \text{Permittivity } \epsilon_0 = 8.854 \times 10^{-12} \text{ F/M.} \end{array}$$