

Register Number:

B.TECH DEGREE EXAMINATIONS:MAY/JUNE 2014

(Regulation 2009)

Second Semester

PHY106: APPLIED PHYSICS

(Common to FT, BIO & TXT)

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

- At absolute zero temperature, the highest filled energy level of metal is called _____
 - de Broglie level
 - Fermi level
 - Lorentz level
 - Maxwell level
- The relation between transition temperature and isotopic mass is _____
 - $T_c \propto M^{1/2}$
 - $T_c \propto M^{-1/2}$
 - $T_c \propto M^{-1}$
 - $T_c \propto M$
- The effective mass of a free electron is _____, when it occupies higher energy levels of allowed band of energies.
 - negative
 - positive
 - Low negative
 - High positive
- Donor type impurity is formed by adding impurity of valency _____
 - 3
 - 4
 - 5
 - 6
- The magnetic dipole moments of neighbouring atoms are anti-parallel and unequal for _____ magnetic material.
 - anti-ferro
 - ferri
 - dia
 - para
- Which one of the following is not used to store magnetic data?
 - floppy disc
 - hard disc
 - compact disc
 - core memory
- The principle used in making metallic glasses is extremely _____
 - slow heating
 - slow cooling
 - rapid heating
 - rapid cooling

- The surface to volume ratio is _____ for nanomaterials.
 - large
 - small
 - moderate
 - same
- _____ is an instrument used for recording the sounds connected with the pumping actions of the heart.
 - ECG
 - EEG
 - PCG
 - BCG
- A photomultiplier tube converts light photons into _____.
 - positrons
 - protons
 - neutrons
 - electrons

PART B (10 x 2 = 20 Marks)

- The electrical resistivity of copper at 300 K is $1.72 \times 10^{-8} \Omega\text{m}$. Compute its Lorentz number if the thermal conductivity is $394 \text{ Wm}^{-1}\text{K}^{-1}$.
- What is Meissner effect?
- Using a band diagram, mark the Fermi level of N and P type semiconductors.
- The Hall coefficient of a specimen of a doped silicon is found to be $3.66 \times 10^{-4} \text{ m}^3/\text{C}$. The resistivity of the specimen is $8.93 \times 10^{-3} \Omega\text{m}$. Find the mobility of the charge carriers.
- Differentiate between diamagnetic and paramagnetic materials.
- List any two properties of ferro electric materials.
- Why metallic glasses are preferred as transformer core material?
- Distinguish between bottom-up and top-down approaches of synthesizing nano materials.
- What is the purpose of ultrasound therapy?
- What is a scintillator?

PART C (5 x 14 = 70 Marks)

- a) Based on classical free electron theory, derive an expression for electrical and thermal conductivity of a conducting material. (7+7)
- (OR)**
- (i) Differentiate between Type I and Type II superconductors (4)
(ii) Describe the construction and working of: (i) SQUID and (ii) Cryotron (5+5)
 - a) (i) Derive an expression for density of electrons in the conduction band of intrinsic semiconductors. (10)

- (ii) Calculate the conductivity and the resistance of intrinsic germanium rod 1 cm (4)
long, 1 mm wide and 1 mm thick at 300 K using the data given:
 $n_i = 2.5 \times 10^{19} / \text{m}^3$, $\mu_e = 0.39 \text{ m}^2 \text{ V}^{-1} \text{ s}^{-1}$ and $\mu_h = 0.19 \text{ m}^2 \text{ V}^{-1} \text{ s}^{-1}$

(OR)

- b) What is Hall effect? Derive an expression for Hall Coefficient. Describe an (2+6+6)
experiment for the measurement of the Hall Coefficient.

23. a) Explain domain theory of ferromagnetism. Using the concept of domains, (10+4)
explain the formation of hysteresis in ferromagnetic materials.

(OR)

- b) Discuss the different types of polarization mechanisms in dielectrics and explain (8+2+4)
their dependence on temperature and frequency of the applied electric field.

24. a) What are shape memory alloys? Discuss their characteristics and list some (2+9+3)
applications.

(OR)

- b) Describe any two methods of fabrication of carbon nano tubes. Give the (12+2)
applications of CNTs.

25. a) (i) Draw the block diagram of basic pulse echo system. (2)
(ii) Explain how the three different scan displays in ultrasonic imaging are used for (12)
data representation.

(OR)

- b) What is nuclear medicine imaging? Discuss the working of Positron Emission (2+ 12)
Tomography.
