

B.TECH.

THEORY EXAMINATION (SEM-II) 2016-17

ENGINEERING PHYSICS-II

Time : 3 Hours

Max. Marks : 100

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION – A

1. Explain the following:

10 x 2 = 20

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| a) What are polar and non-polar dielectrics? | e) What is an intrinsic semiconductor? |
| b) Define magnetic induction and intensity of magnetization. | f) Define Superconductivity. |
| c) What do you mean by depth of penetration in a conductor? | g) Define Nanoscience and nanotechnology. |
| d) Explain the concept of Maxwell's displacement current. | h) Explain the Bragg's law. |
| | i) Define High Temperature Superconductors. |
| | j) Give the relationship between E, P and D vector. |

SECTION – B

2. Attempt any five of the following questions:

5 x 10 = 50

- Derive an expression for electric field strength on a molecule within dielectric. Hence, obtain Claussius-Mossotti equation.
- What is Langevin's theory of dia-magnetism? Show that the magnetic susceptibility is negative and independent of temperature.
- The permittivity of diamond is $1.46 \times 10^{-10} \text{ C}^2 \text{N}^{-1} \text{m}^{-2}$. Determine its dielectric constant and electrical susceptibility. (Given $\epsilon_0 = 8.86 \times 10^{-12} \text{ C}^2 \text{N}^{-1} \text{m}^{-2}$)
- An iron rod of volume 10^{-3} m^3 and relative permeability 1200 is placed inside a long solenoid wound with 5 turns/cm. If a current of 0.5 amp is passed through the solenoid, find the magnetic moment of the rod.
- A beam of X-rays $\lambda = 0.8 \text{ \AA}$ is incident on a crystal at a glancing angle of $8^\circ 35'$ when the first order Bragg's diffraction occurs. Calculate the glancing angle for 3rd order diffraction.
- What is Poynting vector? Discuss the work-energy theorem for the flow of energy in an electromagnetic field.
- Explain type-I and type-II superconductors. Also briefly discuss the important property that changes during transition.
- How does superconducting transition temperature vary with magnetic field? The transition temperature for Pb is 7.2 K. However it loses the superconductivity property if subjected to a magnetic field of $3.3 \times 10^4 \text{ Amp/m}$. Find the value of $H_c(0)$ which will allow the metal to retain its superconductivity at 5K.

SECTION – C

Attempt any two of the following questions:

2 x 15 = 30

- What are carbon nanotubes? Explain CVC technique for its synthesis.
 - Assuming that all the energy from a 1000 Watt lamp is radiated uniformly; calculate the average value of intensities of electric and magnetic fields of radiation at a distance of 2 meter from lamp.
- What is meant by polarization of substance? Mention the different mechanism of polarization in a dielectric.
- Describe Bragg's spectrometer and derive the necessary formula and explain how it is used to study the structure of crystals.