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RF-3473-74

M. Sc. (Part - I) Examination

April / May – 2010

Electronics : Paper - II

(Electromagnetic Fields & Waves, Physics of Electronics Materials)

Time : 3 Hours] [Total Marks : 70

RF-3473

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :
☛ M. Sc. - 1

Name of the Subject :
☛ ELECTRONICS - 2

☛ Subject Code No. : 3 4 7 3 ☛ Section No. (1, 2,.....) : 1

Seat No. :

Student's Signature

(2) Use separate answer book for each section.
(3) Symbols used have their meaning.
(4) Figures to the right indicate full marks.

1 (a) What is the physical significance of divergence of **D** ? (2)

(b) What are Dirichelt and Neumann conditions. (2)

(c) Explain how and why Maxwell modified Amperes law? Why extra term is called displacement current? (2)

(d) Write the two basic leading properties of an antenna arrays. (2)

2 (a) Carry out multipole expansion in power of 1/r for the potential of an arbitary localized volume charge distribution and identify the contribution from various multipoles. (3)

(b) State and interpret Biot-Savarts law. From this deduce the differential form of magnetostatic equations in free space. (2)

(c) A long cylinder of length carries a charge density that is proportional to the distance from the axis; $\rho=ks$, for some constant k. Find the electric field inside this cylinder. (4)

OR

2 (a) Derive the solution of Laplace's equation in rectangular coordinates. (3)

(b) State and prove poyinting theorem. What is unit of poyinting vector? Also state the significance of this theorem as well as vector. (2)

(c) A traveling electromagnetic wave has a maximum value for E for 15 V/m. The medium is a perfect dielectric with $\mu_r = 1$ and $\varepsilon_r = 5$. Find (a) Velocity of the wave (b) Peak Poynting vector (c) Average pointing vector. (4)

3 (a) Derive the solution of Maxwell's equation for charge free unbounded motion. (3)

(b) Give characteristic wave impendence and propagation constant for electromagnetic waves. (2)

(c) A 9500 MHz uniform plane wave is propagating in polystyrene. If the amplitude of electric field intensity is 30V/m and the material is assumed to be lossless. Find (a) phase constant (b) wavelength (c) the velocity of propagation (d)the intrinsic impendence(e)the propagation constant. (4)

OR

.3 (a) Discuss and deduce Linear –Wiechert potential. Why is it called the related potential? (3)

(b) Deriving magnetic field of oscillating Hertzian dipole antenna. (2)

(c) An air filled rectangular wave guide has cross–sectional dimension a=10cm and b= 5 cm. Obtain phase velocity and calculate cutoff frequency of the TE_{01} mode. (4)

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Name of the Examination :

☛ **M. Sc. - 1**

Name of the Subject :

☛ **ELECTRONICS - 2**

☛ Subject Code No. : **3 4 7 4** ☛ Section No. (1, 2,.....) : **2**

Seat No. :

Student's Signature

(2) Use separate answer book for each section.
(3) Symbols used have their meaning.
(4) Figures to the right indicate full marks.

4 (a) What is Hall effect? Define thermal conductivity of metal. (3)

(b) Give miller indices of at least two faces of crystal. (1)

(c) Distinguish between ferromagnetism and antiferromagnetism. (2)

(d) If $m\frac{dv}{dt} = -eE$ where e is the charge and m is the mass of the carrier respectively, show that $\lambda^2 = \frac{mc^2}{4\pi ne^2}$ where λ = London penetration depth. (2)

5 (a) State main features of dc electrical conductivity of metal. (3)

(b) Distinguish Bravais lattice and reciprocal lattices. (2)

(c) The density of NaCl (atomic weight 58.43 gm) is 2.18 gm/cm^3. The crystal has FCC structure. Determine the lattice constant *'a'*. Where Avogadro number is 6.02 x 10^{23} mole^{-1}. (4)

OR

5 (a) State and explain Wiedman Franz law. (3)

(b) State and prove Bloch's theorem and write Born Von Karman boundary condition. (4)

(c) What do you mean by inhomogeneous semiconductor ? (2)

6 (a) Explain tight binding electron approximation. (3)

(b) Classify following crystal on the basis of their bonding: Ge, HI, KBr, NaF, F_2, H_2O (2)

(c) The resistivity of pure silicon at room temperature is 3 KΩm. Calculate the intrinsic carrier density.(μ_e=0.14 m^2/VS, μ_h=0.05 m^2/VS) (4)

OR

6 (a) Write magnetic properties of superconductor. Discuss on the applications of superconductor. (4)

(b) Find the equation of magnetic susceptibility for paramagnetic material. (3)

(c) Define piezoelectricity and ferroelectricity. (2)