



AC-1429

M. Sc. (Sem. II) (Physics) Examination

April / May – 2015

Paper - EL - 423 : Electromagnetic Fields & Waves

Time : 3 Hours]

[Total Marks : 70

Instructions :

(1)

नीचे दशांश देव निशानीवाणी विगतो उत्तरवही पर अवश्य लिखनी.
Fillup strictly the details of signs on your answer book.

Seat No. :

Name of the Examination :
M. SC. (SEM. II) (PHYSICS)

Name of the Subject :
P. - EL - 423 : ELECTRO. FIELDS & WAVES

Subject Code No. : Section No. (1, 2,.....):

Student's Signature

(2) Symbols used have their usual meaning.

(3) Figures to the right indicate full marks.

Q.1	Write any two out of the (A), (B) and (C) below	
(A)	Two infinitely grounded metal plates lie parallel to the xz plane, one at $y=0$, the other at $y=a$ are connected. The one end, at $x=0$, is closed off with an infinite strip insulated from the two plates and maintained at a specific potential $V_0(y)$. Draw a schematic diagram of it and find the potential inside the slot.	7
(B)	(i) Discuss Laplace's equations and second uniqueness theorems in detail.	4
	(ii) State and explain Coulomb's law in electrostatics. Express it mathematically for two point charges	3
(C)	(i) What do you mean by a plasma?. Discuss the conditions for the existence of a plasma.	4
	(ii) Discuss the motion of a charged particle in crossed electric- field and magnetic field..	3
Q.2	Write any two out of the (A), (B) and (C) below	
(A)	What do you understand by electric dipole and quadrupole moment? expressions for electric potential and field at a point in space due to (i) a dipole and (ii) a quadrupole.	7

(B)	(i) What are polar and non-polar molecules of a dielectric ?	4
	(ii) Derive Poisson's and Laplace's equation in Dielectrics.	3
(C)	Derive multipole expansion for electric field. Show that second term due to moment of charge distribution while third term indicate quadrupole moment of Tensor.	7

Q.3	Write any two out of the (A), (B) and (C) below	
(A)	What is magnetic vector potential ? Write Ampers law in terms of vector potential A . Show how his law can be applied to find the magnetic field due to an indefinitely long straight conductor carrying a steady current.	7
(B)	(i) Distinguish between magnetic vector potential and magnetic scalar potential.	4
	(ii) Using Ampere's circuital law to calculate the magnetic field due to solenoid.	3
(C)	Differentiate between Magnetostatics and electrosatics. Derive expression for the magnetic vector potential and magnetic induction due to a small element of a current carrying current at a large distance.	7
Q.4	Write any two out of the (A), (B) and (C) below	
(A)	Introduce Phasor notation and show the relation ship between time varying and notation by diagram. Derive Maxwell's equations in Phasor form.	7
(B)	(i) Define time independent complex poyning vector and derive complex pointing theorem.	4
	(ii) Find the phase velocity and the magnitude of the attenuation constant of plane waves at a frequency 10 GHz in polyethylene, given. $\epsilon_r = 2.3$, $\sigma = 2.56 \times 10^{-4}$ mho/meter and $\mu = \mu_0 = 4\pi \times 10^{-7}$ henry/meter.	3
(C)	State Maxwell's equations for the electromagnetic field and obtain the wave equations for E and B in homogeneous isotropic non-conducting medium.	7
Q.5	Write any two out of the (A), (B) and (C) below	
(A)	What is wave guide? Discuss in detail theory of wave guide with reference of TM mode of propagation of electromagnetic waves	7
(B)	What are retarded potential? Explain and describe the retarded potential satisfy the inhomogeneous wave equation in QED.	7
(C)	Define antenna array. Discuss the properties of Broad side and end fire array. Distinguish between the radiation by antenna and antenna arrays.	7