T.Y.B.SC. SEM – VI (2014 COURSE) : SUMMER - 2018

SUBJECT : PHYSICS: ELECTRODYNAMICS

Day : **Tuesday** Time : **12.00 NOON TO 02.00 PM**

Date : **10/04/2018** **S-2018-0762** Max. Marks : 40.

N.B.:

1) All questions are **COMPULSORY.**
2) Figures to the **RIGHT** indicate full marks.
3) Use of electronic calculator/ log table is allowed.

Q.1 Attempt any **TWO** of the following: **(10)**

a) Find the magnetic field associated with $E = E_0 \cos\beta x \cos wt\hat{a}_z$

b) Obtain an expression for electric field due to a point charge +q placed in infinite dielectric.

c) Define method of electrical image. Write the procedural steps for solving a particular electrostatic problem.

Q.2 Attempt any **TWO** of the following: **(10)**

a) State Ampere's circuital law and show that $\vec{\nabla}\times\vec{B}=\mu_0\left(\vec{J}+\frac{\partial\vec{D}}{\partial t}\right)$.

b) Write Maxwell's equation in differential and integral form. What is the physical significance of Maxwell's equation?

c) Find the vector potential of an infinite solenoid having 'n' turns per unit length, radius R and carrier a current I through its winding.

Q.3 Attempt any **TWO** of the following: **(10)**

a) Obtain the relation between electric susceptibility and dielectric constant.

b) Prove that volume charge density ρ_p is equal to negative divergence of polarisation.

c) A plastic disc of radius 'a' has a charge uniformly distributed over its surface. If the disc is rotated at an angular frequency 'ω' about its axis, show that the magnitude field at the centre of the disc is $B=\frac{\mu_0\omega q}{2\pi a}$.

Q.4 Attempt any **FIVE** of the following: **(10)**

a) A conductor 10 m long lies along 'Z' direction with a current of 1A in the $\hat{a}_z$ direction. Find the force, if $\vec{B}=0.04\hat{a}_x$ Tesla.

b) State (i) Faraday's law of electromagnetic induction (ii) Lenz's law.

c) Find the magnitudes of $\vec{D}\&\vec{P}$ for dielectric material in which E = 0.10 MV/m and $\chi_e = 5$.

d) Show that another point form of Faraday's law is $\vec{E}=-\frac{\partial}{\partial t}\vec{A}$, where $\vec{A}$ is magnetic vector potential.

e) State Poisson's and Laplace's equation.

f) Explain the terms (i) Surface charge density (ii) Linear charge density

g) Two long parallel wires separated by 1 cm in air carry current of 50 amp each. Find the force on one meter length of wire.

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