

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

M.Sc. (Physics) (Sem.-2)

Subject Code : MSPH-424-21

M.Code : 91905

Date of Examination: 19-12-2022

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. **Write briefly :**
 - a) Write different types of polarization.
 - b) Define Ampere's Force law.
 - c) Explain Uniqueness theorem.
 - d) Write the Maxwell's equation in differential form.
 - e) What is Brewster's angle?
 - f) Differentiate between TE and TM waves.
 - g) How the potential V in multipole expansion varies with r in Quadrupole?
 - h) Define Coulomb gauge.
 - i) Explain the function of an antenna.
 - j) Write Laplace equation in different coordinates.

SECTION-B

- 2) Explain how Maxwell modified Ampere's law to make it consistent with the equation of continuity. Calculate the displacement current density when electric flux density is $20\sin 0.5t$.
- 3) What are scalar and vector potentials? Obtain expression for inhomogeneous wave equations for both scalar and vector potentials.
- 4) Obtain an expression for the reflection and transmission of an electromagnetic wave incident normally on a plane between two dielectrics.
- 5) Define electrostatic energy and derive an expression for energy density of electric field E in free space.
- 6) Write an expression for electrostatic potential by method of images, when a conducting sphere of radius 'a' is placed in uniform electric field.

SECTION-C

- 7) Write and derive the boundary conditions at the interface between two dielectrics.
- 8) Write Maxwell's equations for free space. Obtain the wave equation for E and B for conducting medium. Calculate skin depth in a medium having conductivity $2.2 \times 10^7 \text{ Sm}^{-1}$ for EM waves of frequency 10 KHz. Given $\mu = 4\pi \times 10^{-7} \text{ Hm}^{-1}$.
- 9) Determine the modes in a rectangular wave guide by considering the propagation of TE waves. A rectangular wave guide of internal dimensions ($a=4\text{cm}$ and $b=3\text{cm}$) is to be operated in TE_{11} mode. Find the minimum operating frequency.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.