SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.
M.Sc. Physics - END SEMESTER EXAMINATIONS APRIL - 2024
SEMESTER - II

20PPHCT2006 – Electromagnetic Theory and Plasma Physics

Total Duration : 2 Hrs. 30 Mins. Total Marks : 60

Section B

Answer any **SIX** questions $(6 \times 5 = 30$ Marks)

1. State and prove the uniqueness theorem.
2. Show that the potential at any external point due to a charge distribution can be expressed as the contribution of the moments of monopole, dipole, quadrupole etc.
3. Obtain the expression for resultant electric field of the dielectric medium which is in uniform field.
4. A magnetic sphere of radius R is placed in uniform external magnetic field H_o. Find out the potential and field inside and outside the sphere.
5. Define magnetic vector potential and discuss its utility in magnetostatics.
6. What is Gauge invariance? Prove that the Lorentz condition is in variant under gauge transformation.
7. What is waveguide? Derive the expression for transverse electric waves perfectly propagating in a rectangular waveguide.
8. For a plane electromagnetic wave in free space show that, E and H are mutually perpendicular and also perpendicular to the direction of propagation of wave.

Section C

I - Answer any **TWO** questions $(2 \times 10 = 20$ Marks)

9. Write down Laplace's equation in spherical polar coordinates and obtain its solution.
10. Obtain the expression for Magnetostatic energy and its energy density.
11. Show how the Maxwell's equations for the electromagnetic field can be written as a pair of equation in term of Scaler and Vector potentials.
12. Discuss the transverses and longitudinal motion of the fluid in the magnetic field.

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II - Compulsory question $(1 \times 10 = 10$ Marks)

13. State and Establish poynthing theorem for conservation of energy in Electromagnetic field.

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