



28/5/24

**DOON UNIVERSITY, DEHRADUN**  
**END Semester Examination, IInd Semester, 2024**  
**Department of Physics, School of Physical Sciences**  
**Course:PHC:151 Electricity and magnetism**

**Time Allowed: 2Hours**

**Maximum Marks: 30**

**Note: Attempt All Questions**

**SECTION: A**

**(Marks:1X6=06)**

1. The displacement current term in Ampere's law was added by Maxwell to account for:
  - a) Magnetic fields generated by electric currents
  - b) Electric fields induced by changing magnetic fields
  - c) Electric fields produced by electric charges
  - d) Magnetic fields produced by magnetic charges
2. The potential difference between two points in an electric field is directly related to the:
  - a) Magnitude of the electric field
  - b) Direction of the electric field
  - c) Charge of the object
  - d) Distance between the points
3. The strength of the magnetic field around a straight current-carrying wire depends on:
  - a) The length of the wire
  - b) The voltage across the wire
  - c) The resistance of the wire
  - d) The distance from the wire.
4. Write down expression for magnetic field outside the toroid.
5. Is there any change occurs when the electric field is time varying?
6. If no charge source is present Poisson's equation converts into which equation.

**SECTION: B      Attempt any 4 questions**

**(Marks:3X4=12)**

7. Derive Continuity equation in Electromagnetic theory.
8. Two point charges  $Q_1= 3nC$ ,  $Q_2= -2nC$  are placed at  $(0,0,0)$  and  $(0,0,-1)$  respectively. Assuming zero potential at infinity, find the potential at: (a)  $(0, 1, 0)$     (b)  $(1, 1, 1)$ .
9. What is displacement current? Find out the ratio of conduction current to displacement current if electric field is:  $E=E_m \cos \omega t$ .
10. Obtain the value of electric field in terms of vector and scalar potentials.
11. Verify that given field  $E=yz \hat{a}_x + xz \hat{a}_y + ay \hat{a}_z$  v/m can be electrostatic field.

**SECTION: C      Attempt all questions**

**(Marks:6X2=12)**

11. Calculate divergence of magnetic field is zero from Bio-Savart law.
12. State ampere's Law. Explain the concept of Maxwell's displacement current and show how it led to a modification of the ampere's Law.