236me004

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA

School of Physics

B. Tech. 1st Semester, Minor Exam-1

Course Title: Engineering Physics

Course Code: PHL 1012 **Time: 1hr**

Total Marks: 20 **Date: 11-10-2023**

Note: *Each question carries 2 marks in section A and 3 marks in in section B. Do only 4 questions in section B*

Section A

Q. No.1: State Gauss divergence theorem and Stokes theorem

Q. No.2: Explain Dirac Delta function in detail

Q. No.3: Evaluate the curl of a vector

$$\vec{A} = (2xz + 3y^2)\hat{y} + (4yz^2)\hat{z}$$

Q. No.4: Evaluate the divergence of a vector

$$\vec{A} = y^2\hat{x} + (2xy + z^2)\hat{y} + (2yz)\hat{z}$$

Section B:

Q. No.5: Derive an expression for work done to assemble a group of point charges?

Q. No.6: Calculate electric field inside and outside of a uniformly charged sphere of charge density ρ?

Q. No.7: Find the electric field at a distance z above the midpoint of a straight-line segment of length of 2L that carries uniform line charge λ?

Q. No.8: Calculate electrostatic energy of uniformly spherical shell of radius R containing total charge Q?

Q. No.9: Calculate electric field at a distance s from the long infinite wire carrying uniform line charge?

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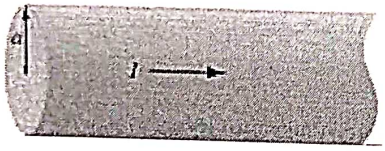
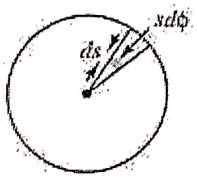
Q. No. 1: (a) A current I uniformly distributed over a wire of circular cross section, with radius "a" as shown in Figure. Find the volume current density **J**? [2 Marks]

(b) Suppose the current density in the wire is proportional to the distance from the axis, **J** = ks (for some constant k). Find the total current in the wire? [3 Marks]

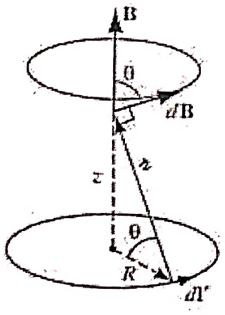




Or

A steady current I flows down a long cylindrical wire of radius **R**. Find the magnetic field, both inside and outside the wire, if the current is uniformly distributed over the outside surface of the wire? [5 marks]

Q. No.2: *Find the magnetic field a distance z above the canter of a circular loop of radius* **R**, *which carries a steady current* **I** Figure: [5 marks]



Or

Obtain magnetic field due to a long straight conductor of infinite length using Biot-Savarts law [5 marks]

Q. No.4: Write down Differential and Integral form of four Maxwell Equations [4 Marks]

Q. No. 5: Explain Planks law of Black body radiation in detail [3 Marks]

Q. No. 6: Explain Photo electric effect in detail [3 Marks]