Please check that this question paper contains 9 questions and 02 printed pages within first ten minutes.

MORNING

[Total No. of Questions: 09] 09 JAN 2023 [Total No. of Pages: 02]

Uni. Roll No. .....

Program: B.Tech. (Batch 2018 onward)
Semester: 3rd
Name of Subject: Electromagnetic Fields
Subject Code: PCEE-104
Paper ID: 16067
Scientific calculator is Allowed

Time Allowed: 03 Hours **Max. Marks: 60**

NOTE:

1) Parts A and B are compulsory
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
3) Any missing data may be assumed appropriately

Part – A **[Marks: 02 each]**

Q1.

a) State Ampere's Circuit Law and Amper's Force Law.

b) Define the terms 'Electric intensity' and Electrical displacement density.

c) What is the physical significance of a gradient of a scalar field.

d) Write down the Maxwell's equations for static fields.

e) Find the volume of sphere of radius 'a' from the differential volume.

f) The magnetic flux through the coil perpendicular to its plane and directed into the paper is varying according to the relation $\emptyset = (9t^2 + 20t + 7)$ milliweber. Calculate the e.m.f. induced in the loop at t = 6 seconds.

Part – B **[Marks: 04 each]**

Q2. State and prove magnetic boundary conditions.

Q3. How displacement current is different from conduction current? Discuss in brief.

Q4. Discuss Laplace and Poisson's equation.

Q5. What do you mean by electric field intensity and prove that $E = -\nabla V$.

Q6. Derive an expression for the electromagnetic wave equation in perfect dielectric medium.

P.T.O.

Q7. Prove that electric field intensity and magnetic field intensity are perpendicular to each other.

Part – C **[Marks: 12 each]**

Q8. State and prove Gauss's law in electrostatics. Deduce the expression for the electric field due to an infinite sheet of charge.

OR

State and prove Gauss Divergence theorem. Using Gauss divergence theorem to evaluate $\oint F.dS$ over a closed surface 'S', where $F = x^3 a_x + y^3 a_y + z^3 a_z$ and 'S' is the surface of sphere $x^2 + y^2 + z^2 = a^2$.

Q9. Derive and explain Maxwell's equation in integral and point forms for conducting medium and free space.

OR

Prove that $\frac{E}{H} = 120\pi$ ohms for a uniform plane wave.

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