B.Sc. Third Semester Degree Examination

PHYSICS

Paper 3 - Electricity, Vector Analysis and Electromagnetic Theory

(Old Syllabus)

Time : 3 Hours] [Max. Marks : 80

Instructions : *(1) Answer* **all** *questions from Section A,* **any Five** *from Section B and* **any Four** *from Section C.*

(2) Write answers to Section A questions in **the first two pages only.**

SECTION - A

I Answer the following (15 × 1 = 15)

1. In which circuit the current leads the applied AC voltage by 90°

2. Define Wattless current.

3. How do you [illegible]?

4. Can two equipotential [illegible]?

5. State Gauss Law

6. Define electric field intensity

7. Define poynting vector.

P.T.O.

8. What do you mean by rms value of current?

9. What is half power frequency bandwidth?

10. What is electronic filter?

11. If $\phi(x, y, z) = 4xy + 3yz^2$, Calculate gradient of ϕ

12. What is dipole moment?

13. Whether stationary charge produce magnetic field?

14. State Lenz's law

15. Which law the equation $\int \vec{B} \cdot d\vec{s} = \frac{q_{in}}{\varepsilon_0}$ represents.

SECTION – B

II. Answer any **five** of the following (5 × 5 = 25)

16. Explain how voltage and frequency are measured using CRO.

17. Show that $\vec{F} \cdot (\vec{\nabla} \times \vec{A}) = 0$.

18. If $\vec{F} = x^2y\,\hat{i} + y^2z\,\hat{j} + z^2\hat{k}$, find curl $\vec{F}$.

19. Describe Hertz experiment to produce and detect E.M. waves.

20. Derive an expression for the current in an RL series Ac circuit.

21. State and explain Coulomb's law in electrostatics.

22. Write and explain Maxwell's equations in free space.

SECTION - C

Answer any **four** of the following : **(4 × 10 = 40)**

23 (a) Derive an expression for the current and impedance in an RC series ac circuit.

(b) Explain low pass RC filter with circuit diagram. **(5+5)**

24 (a) State and prove Ampere's circuital law.

(b) Show that $\nabla \times (\nabla \times A) = \nabla(\nabla \cdot A) - \nabla^2 A$ **(5+5)**

25 (a) State and explain Coulomb's law in electrostatics.

(b) Set up Poisson and Laplace equation in vector form **(5+5)**

26 (a) Derive expression for the current and impedance in an LCR series circuit.

(b) Derive condition for minimum impedance and the corresponding frequency. **(5+5)**

27 (a) Describe Hertz experiment to produce electromagnetic waves.

(b) Write a note on Poynting vector. **(5+5)**

28 (a) Explain the physical significance of Maxwell's equations.

(b) Write a note on skin effect. **(5+5)**

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