THIRD SEMESTER BSc DEGREE EXAMINATION, NOVEMBER 2020

(CBCSS - UG)

CC19U PHY3 B03 - ELECTRODYNAMICS - I

(Physics - Core Course)

(2019 Admissions - Regular)

Time : 2.00 Hours   Maximum : 60 Marks

Credit : 3

Part A (Short answer questions)

Answer *all* questions. Each question carries 2 marks.

1. What are the expressions for **A.B** and **A x B** in component form?

2. Explain the fundamental theorem of gradients.

3. Express elemental displacement and elemental volume in spherical polar coordinates.

4. Graphically represent the potential inside and outside a spherical shell which carries a uniform surface charge.

5. Show that the electric field inside a cavity is zero.

6. What is polarization? Define polarization vector P.

7. Explain susceptibility tensor.

8. Explain current density.

9. Define Gauss's law of magnetostatics

10. Give the important differences between various types of magnetic materials.

11. What are bound currents?

12. How hysterisis loop can be utilized for selecting materials suitable for (i)permanent magnet (ii)electromagnet

(Ceiling: 20 Marks)

Part B (Short essay questions)

Answer *all* questions. Each question carries 5 marks.

13. Find the gradient of $r = \sqrt{x^2 + y^2 + z^2}$ (the magnitude of the position vector)

14. Using Gauss flux theorem, find the field outside, on the surface and inside a charged conducting sphere (solid/hollow) of radius 'a'.

15. Derive an expression for the energy of a point charge distribution.

16. Find an expression for the force acting on a dipole in a non-uniform electric field.

17. What is dielectric constant? Obtain a relation connecting susceptibility and dielectric constant.

18. A rectangular coil of sides 8 cm x6 cm having 2000 turns and carrying a current of 200 mA is placed in a uniform magnetic field of 0.2T directed along the positive x-axis. What is the maximum torque the coil can experience?

19. How does one modify Ampere's law while considering magnetised materials?

(Ceiling: 30 Marks)

Part C (Essay questions)

Answer any *one* question. Each question carries 10 marks.

20. With the help of suitable diagrams, derive the boundary conditions for electric field vector E. Also obtain the boundary conditions for electric potential.

21. What are magnetic boundary conditions? Derive them in vector form.

(1 × 10 = 10 Marks)

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