2B3N24101   (Pages : 2)   Reg. No:........................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.Sc Physics Degree Examination, November 2024

BPH3B03 – Electrodynamics – I

(2022 Admission onwards)

Time: 2 hours   Max. Marks : 60

The symbols used in this question papers have their usual meanings

Section A- Short Answer Type

(Answer all questions in two or three sentences, each correct answer carries a maximum of 2 marks)

1. What is the torque experienced by an electric dipole placed in a uniform electric field?

2. Define volume current density.

3. Define Stoke's theorem.

4. Starting from Gauss's law in electrostatics, obtain Poisson's equation.

5. Write down the Ampere's law in magnetized objects.

6. State Ampere's circuital theorem.

7. What do you mean by electric susceptibility? Write down the relation between electric susceptibility and dielectric constant.

8. Define Gauss's law and write down its differential form.

9. What do you mean by bound currents ?

10. Write down the electrostatic boundary conditions for the electric displacement vector.

11. Define gradient of a scalar function. Give its physical interpretation.

12. What do you mean by curie temperature ?

(Ceiling-20)

Section B- Paragraph/ Problem Type

(Answer all questions in a paragraph of about half a page to one page, each correct answer carries a maximum of 5 marks)

13. Two large metal plates, each of area A are held a small distance 'd' apart. If we put a charge Q on each plate, what is the electrostatic pressure on the plates ?

14. Explain the field of a polarized object and discuss the concept of bound charges.

15. Find the magnetic field a distance 'z' above the centre of a circular loop of radius R, which carries a steady current I.

16. Explain cylindrical polar coordinates. Obtain the expressions for general infinitesimal displacement vector, surface element and volume element in cylindrical polar coordinates.

17. What do you mean by the capacitance? Obtain the expression for the capacitance of a parallel plate capacitor.

18. Evaluate the integral $\int_{2}^{6}(3x^2 - 2x - 1)\delta(x - 3)\, dx$.

19. Explain how magnetic field effects atomic orbitals and how it can be interpreted to account for the diamagnetism.

(Ceiling- 30)

Section C- Essay Type
Answer any one question. Answer carries 10 marks

20. Starting from the energy of a point charge distribution show that electrostatic energy can be stored in fields.

21. State and explain Biot-Savart law. Obtain the expression for the force per unit length between two long straight conductors carrying a steady current of I_1 and I_2 separated by a distance d by free space.

(1x10= 10 Marks)

2B3N24102   (Pages : 2)   Reg. No:.........................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.ScDegree Examination, November 2024

BPH3C03 – Mechanics, Relativity, Waves & Oscillations

(2022 Admission onwards)

Time: 2 hours   Max. Marks : 60

Section A – Short Answer type.

(Answer all questions in 2 or 3 sentences, each correct answer carries a maximum of 2 marks)

1. What is meant by Galilean invariance?

2. State the postulates of special relativity.

3. How did the Michelson – Morley experiment invalidate the concept of ether?

4. What are fictitious forces?

5. Explain anharmonic oscillations.

6. Explain uncertainty principle.

7. What is meant by time dialation?

8. Explain the significance of mass energy relation.

9. What is a centre of mass reference? Why is it called zero momentum frame?

10. Distinguish between phase velocity and group velocity.

11. State and explain the law of conservation of linear momentum.

12. Write down Schrodinger equation .Explain the symbols.

(Ceiling – 20)

Section B – Paragraph / Problem type.

(Answer all questions in a paragraph of about half a page to one page, each correct answer carries a maximum of 5 marks)

13. Derive the Galilean transformation equations.

14. Prove that for a harmonic oscillator average potential energy and average kinetic energy are equal.

15. A particle of mass 10 g is at rest in an inertial frame. Consider a frame rotating at an angular speed of 10 radians per second in which the body is at a distance of 5 cm from the axis of rotation. Find the Coriolis and centrifugal forces on the body in the rotating frame.

16. A rod is moving with velocity 0.6C with respect to the laboratory. If an observer situated in laboratory measures is length 1 meter, Calculate its proper length.

17. A stone of mass 100 g is revolved at the end of a string of length 50 cm at the rate of 2 revolutions per second. Determine its angular momentum. If the stone makes only one revolution per second after 25 seconds, find the torque applied.

18. What are eigen values and eigen functions? Illustrate with examples.

19. Calculate the de Broglie wavelength of a 1000kg automobile travelling at 100 m/s.

(Ceiling – 30)

SECTION C – Essay type
(Essays - Answer in about two pages, any one question. Answer carries 10 marks)

20. State the postulates of special theory of relativity and hence derive the Lorentz transformation equations.

21. Derive an expression for the energy density of a plane progressive wave.

(1 x10 = 10 marks)