

1B3N23101

(Pages : 2)

Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.Sc Physics Degree Examination, November 2023

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. Write down Gauss's law in presence of dielectrics and explain the terms involved.
2. State Biot-Savart law.
3. Define Gauss's divergence theorem.
4. Under what condition Poisson's equation reduces to Laplace's equation?
5. Write down the expression for the torque experienced by a magnetic dipole placed in a uniform magnetic field.
6. Write down the equation of continuity and mention the terms involved.
7. What are linear dielectrics?
8. Write down the electrostatic boundary conditions for the electric field vector.
9. What do you mean by magnetic susceptibility? Write the relation between magnetic susceptibility and permeability.
10. Write down the expressions for bound surface charge density and bound volume charge density.
11. Define curl of a vector function. Give its physical interpretation.
12. What are linear magnetic materials?

**(Ceiling-20 Marks)**

### 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. Three charges are situated at the corners of a square of side ' $a$ '. How much work does it take to bring in another charge ' $+q$ ', from far away and place it in the fourth corner?
14. Obtain the expression for the torque experienced by a dipole placed in an uniform electric field. What will be the net force on the dipole if the electric field is non-uniform?
15. State and explain Ampere's circuital theorem. Using this theorem find the magnetic field due to a very long solenoid.
16. Explain spherical polar coordinates. Obtain the expressions for general infinitesimal displacement vector, surface element and volume element in spherical polar coordinates.
17. Explain Gauss's law in electrostatics. Find the electric field intensity at a point inside the charged sphere whose charge density varies with the distance from the centre of the sphere as  $\rho = k r$ , where  $k$  is a constant.
18. Evaluate the integral  $\int_{-\infty}^{+\infty} \ln(x+3)\delta(x+2) dx$
19. What are magnetic domains? Draw the hysteresis curve of a ferromagnetic material and explain it.

(Ceiling- 30Marks)

### Section C- Essay Type

*Answer any one question. Answer carries 10 marks*

20. Discuss electrostatic properties of a conductor. Obtain the expression for electrostatic pressure on the surface of a conductor.
21. State and explain magnetic Lorentz force. Obtain the trajectory of a charged particle of charge ' $q$ ' moving in a crossed uniform electric and uniform magnetic field.

(1x10= 10 Marks)



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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.Sc Degree Examination, November 2023

BPH3C03 – Mechanics, Relativity, Waves &amp; 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. With example, define inertial frame of reference.
2. Use Galilean transformations to show that the distance between two points  $(x_1, y_1, z_1)$  and  $(x_2, y_2, z_2)$  is invariant in two inertial frames.
3. Explain the principle of the rocket
4. Comment on 'Moving clock runs slow.'
5. What happens to the amplitude as time increases during damping?
6. What is a centre of mass reference? Is it an inertial frame or non-inertial frame of reference?
7. Give two limitations of classical mechanics.
8. What do you mean by energy density?
9. Write down the momentum –energy relation in relativity. Explain the symbols.
10. Define central force motion. List any two features of central force motion.
11. What is ultra violet catastrophe?
12. Obtain the differential equation of a simple harmonic oscillator.

**(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. Describe the Michelson Morley experiment
14. Explain the concept of potential energy curve.
15. State the law of conservation of angular momentum. Explain one application.

16. If a force acting on a particle at any point  $(x, y, z)$  is  $(5x\hat{i} + xy\hat{j} + z\hat{k})$ , how much work is done, when the particle moves from the point  $(5, 2, 1)$  to the point  $(5, 3, 2)$ ?
17. In the laboratory the life time of a particle moving with speed  $2.8 \times 10^8$  m/sec, is found to be  $2.5 \times 10^{-7}$  sec. Calculate the proper life time of the particle.
18. The work function for Tungsten is 4.52 eV. Radiation of wavelength 198 nm is incident on a piece of Tungsten. Find (a) the cutoff wavelength for Tungsten (b) the stopping potential and (c) maximum kinetic energy of photoelectrons.
19. A plane wave of frequency 256 Hz and amplitude 0.001 mm is produced in air. Calculate the energy density and energy current, given the velocity of sound in air = 332 m/s and density of air =  $1.29 \text{ kg/m}^3$ .

(Ceiling-30)

### SECTION C – Essay type

(Essays - Answer in about two pages, any one question. Answer carries 10 marks)

20. Discuss the motion of particle under damped motion and obtain its differential equation. Write the probable solution and represent it graphically.
21. Briefly explain the physics in a rotating system. Define the coriolis force.

(1 x 10 = 10 marks)