

1B3N20211

(Pages : 2)

Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
Third Semester B.Sc Degree Examination, November 2020
BPH3B03 – Electrodynamics – I
(2019 Admission onwards)

Time: 2 hours

Max. Marks : 60

Section A

**Answer all questions. Answer in two or three sentences.
Each correct answer carries a maximum of two marks.**

1. Distinguish between scalar and vector quantities. Give three examples of each.
2. Two forces of equal magnitude, F act at right angles. Find the magnitude and direction of the resultant.
3. What is the physical significance of divergence of a vector.
4. State and explain Stoke's theorem.
5. State and explain Gauss's law.
6. State Fleming's right hand rule.
7. What is equipotential surface? Give an example.
8. Derive an expression for the energy of a dipole in an electric field.
9. Determine the energy density of an electric field within a linear dielectric medium with permittivity ϵ .
10. Derive equation of continuity.
11. Discuss magnetization.
12. Explain retentivity and coercivity.

(Ceiling: 20 Marks)

Section B (Paragraph/Problem)

**(Answer all questions in a paragraph of about half a page to one page.
Each correct answer carries a maximum five marks)**

13. Show that $\delta(kx) = \frac{1}{|k|} \delta(x)$
14. Find the magnitude and direction of result of subtraction of two vectors.
15. Derive the expression for energy in a dielectric medium
16. At the interface between one linear dielectric and another the electric field lines bends.
Show that $\frac{\tan\theta_1}{\tan\theta_2} = \frac{\epsilon_1}{\epsilon_2}$
17. Discuss magnetostatic boundary conditions
18. An infinitely long cylinder of radius R carries a frozen magnetization $\vec{M} = kr\hat{z}$ parallel to the axis. There is no free current anywhere. Find the magnetic field inside and outside the cylinder.
19. Derive the expression for vector potential in terms of bound currents.

(Ceiling:30Marks)

Section C (Essay)

Answer anyone in about two pages .Each question carries ten marks)

20. Derive an expression for the capacitance of a parallel plate capacitor and spherical capacitor. Also set up an expression for energy density of a capacitor.
21. State Biot - Savart's law and apply it to find the magnetic field along the axis of the coil carrying current.

(1x10=10 Marks)

1B3N20212

(Pages : 2)

Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
Third Semester B.Sc Degree Examination, November 2020
BPH3C03 – Mechanics, Relativity, Waves & Oscillations
(2019 Admission onwards)

Time: 2 hours

Max. Marks : 60

Section A

Answer all questions. Answer in two or three sentences.
Each correct answer carries a maximum of two marks.

1. Write the Galilean transformation equations.
2. What is the need of studying different frames of reference?
3. What is Coriolis force?
4. What is energy function?
5. A particle is released from a height h from the surface of the earth. Show that energy function of the conservative force field is invariant to change of position and time.
6. Give any three characteristics of central force motion
7. Explain proper frame & proper time.
8. State postulates of special theory of relativity.
9. What is ether hypothesis?
10. Define group velocity of the wave packet.
11. Show that for a harmonic oscillator the total energy is proportional to the square of the amplitude.
12. Distinguish between progressive and stationary wave.

(Ceiling: 20 Marks)

Section B (Paragraph/Problem)

**(Answer all questions in a paragraph of about half a page to one page.
Each correct answer carries a maximum five marks)**

13. Calculate the fictitious force and total force on a body of mass 10 kg, relative to a frame moving vertically upwards on earth with an acceleration of 5m/s^2 , $g = 9.8\text{ m/s}^2$
14. The angular velocity of a rotating rigid body about an axis is $\omega = 4i + j - 2k$. Find the linear velocity of a point p on the body whose position vector relative to a point on the axis of rotation is $2i - 3j + k$
15. A particle is acted on by constant forces $3i + 2j + 5k$ and $2i + j - 3k$ and is displaced from a point whose position vector is $2i - j - 3k$ to a point whose position vector is $4i - 3j + 7k$. Calculate the work done.
16. Calculate the work done when a force $F = 3xy\ i - y^2\ j$ moves a particle in the X-Y plane from (0,0) to (1,1) along the parabola $y = 2x^2$.
17. Derive Einstein's mass energy relation.
18. Calculate the De-Broglie wave length associated with an electron of energy 5MeV,
 $m_e = 9.1 \times 10^{-31}\text{ kg}$, $h = 6.62 \times 10^{-34}\text{ Js}$.
19. A 100 g mass attached to a spring, is set into oscillations from its equilibrium position with initial velocity of 5 cm/sec. The time of oscillation is measured to 2sec. Find the maximum displacement and the spring constant.

(Ceiling:30Marks)

Section C (Essay)

Answer anyone in about two pages .Each question carries ten marks.

20. Distinguish between inertial and non inertial frames of reference. For Cartesian frames S, and S' with common origin and Z axis, work out the transformation equation for velocity and acceleration when S' rotates about the common Z axis with constant angular velocity.
21. (a) State and explain the principle of conservation of angular momentum. Show that for central force motion the angular momentum is conserved and hence the areal velocity remains constant.
(b) Give two examples of dynamical systems to illustrate the consequences of angular momentum conservation.

(1x10=10 Marks)