41

1B4M20209 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

**Fourth Semester B.Sc Degree Examination, March/April 2020**

**BPHY4C04 – Electricity, Magnetism and Nuclear Physics**

(2018 Admission onwards)

Time: 3 hours Max. Marks : 64

## Section A

**Answer all questions. Each question carries one mark**

1. The relative permeability of water is……..
2. Write the mathematical expression of Gauss theorem
3. Give two examples of materials with zero temperature coefficient of resistance.
4. What is angle of dip at the magnetic equator?
5. What is relaxation time?
6. What are control rods?
7. In a beta decay, atomic number increases by one .How?
8. Who discovered Cosmic rays?
9. The mass equivalent of 931 MeV is…..
10. Particles with integer spin are called ……

**(10x1 =10Marks)**

## Section B

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

11. Two field lines will never intersect.Why?
12. What are equipotential surfaces?
13. What are nuclear reactors?
14. Write Tangent law in Magnetism.
15. Account for the instability of heavy nucleus.
16. State the law of radioactive disintegration.
17. What are secondary cosmic rays?

**(7x2=14Marks)**

## Section C

**Answer any three questions. Each question carries four marks**

18. What is electrostatic shielding? Give one application
19. Derive an expression for the temperature coefficient of resistance in terms of resistances at different temperatures.
20. What are the magnetic elements of earth?
21. What is nuclear fission?Give an example.
22. Write a short note on latitude effect of Cosmic rays.

**(3x4=12 Marks)**

## Section D

**Answer any Three questions. Each question carries Four marks**

23. Two charges 20 μC and -20 μ C are placed1cm apart in air. Calculate the electric field on the equatorial line.

24. A platinum wire has a resistance of 8 ohm at $0^0$Cand 15 ohm at $200^0$C.Calculate the temperature coefficient of resistance of platinum.

25. Earth's magnetic field at a place is $0.458 \times 10^{-4}$T.Angle of dip is $54^0$.Find vertical and horizontal component of magnetic field.

26. The half life of Uranium is $4.58 \times 10^9$years.Calculate time taken for 70 % of it to disintegrate.

27. Find the energy released in eV in the following equation.
$_{92}U^{238} \rightarrow {}_{90}Th^{234} + {}_2He^4$ Mass of U=238.050786 unit, Mass of Th=234.043583 unit, Mass of He=4.002603unit

**(3x4=12 Marks)**

## Section E

**Answer any two questions. Each question carries eightmarks.**

28. Explain the term capacitor and capacitance. Obtain the expression for capacitance of a parallel plate capacitor.

29. Explain the principle and working of potentiometer. How it is used to determine the resistance and resistivity of a wire?

30. Describe with theory, the determination of magnetic moment of a magnet using Searls vibration magnetometer.

31. Briefly explain the classification of elementary particles.

**(2x8=16Marks)**

42

34M20208 (Pages : 3) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

**Fourth Semester B.Sc Degree Examination, March/April 2020**

**BPHY4B04 – Electrodynamics I**

(2018 Admission onwards)

ime: 3 hours Max. Marks : 80

*Symbols used in this question paper have their usual meanings*

## SECTION A
**(Answer in a word or phrase)**
**Answer *ALL* questions; each question carries 1 mark**

1. Write down Coulomb's law in electrostatics.
2. Give the relationship between electric field and electric potential.
3. What will be the direction of electric field at the surface of a good conductor?
4. How the normal components of magnetic field behave at a boundary?
5. What is the physical meaning of the equation $\nabla \cdot \mathbf{B} = 0$?

**Questions 6 to 10: Write True or False**

6. Volume current density is a scalar quantity.
7. Magnetic fields cannot increase the kinetic energy of a charged particle.
8. The field of a magnetised object is due to the bound volume current density alone.
9. The area of magnetic domains increases when an external magnetic field is applied.
10. A substance having relative permeability less than one is diamagnetic.

**(10 × 1 = 10 marks)**

## SECTION B
**(Answer in Two or Three sentences)**
**Answer *ALL* questions. Each question carries 2 marks**

11. List three properties of electric field lines.
12. What are the three continuous charge distributions?
13. Mention the three special techniques for calculating potentials.
14. Distinguish between polar and non polar molecules. Give examples.
15. State and explain the equation of continuity.
16. Define magnetic vector potential. Express it in terms of volume current density.
17. What is a B-H curve? Draw a typical B-H curve.

**(7 x 2 = 14 marks)**

## SECTION C

**(Answer in a paragraph of about half a page to one page)**
**Answer any *FIVE* questions. Each question carries 4 marks**

18. Derive an expression for the electric potential due to a localised charge distribution.
19. Calculate the force on a surface charge on a conductor.
20. Explain the method of solving two dimensional Laplace's equation.
21. State and explain the boundary conditions on electric field and displacement vectors.
22. Describe the motion of a charged particle in a cyclotron.
23. Find the vector potential of an infinite solenoid with N turns per unit length, radius R, carrying a current I.
24. How magnetic materials are classified into dia, para and ferro magnets? Give examples for each

**(5 × 4 = 20 marks)**

## SECTION D

**(Problems- Write all relevant formulae. All important steps carry separate marks)**
**(Answer any *FOUR* questions. Each question carries 4 marks)**

25. A circular plane sheet of radius 1m is placed in an electric field of 200 $NC^{-1}$ making an angle $60^{\circ}$ with the field. Estimate the electric flux through the sheet.
26. A parallel plate capacitor has circular plates of 8.2 cm radius and 1.3 cm separation. Calculate its capacitance. What charge will appear on the plates if a potential difference of 120 V is applied?
27. A metal sphere of radius 'a' carries a charge Q and it is surrounded by a linear dielectric material of permittivity $\varepsilon$ out to a radius 'b'. Calculate the potential at the centre of the sphere.
28. A cyclotron has an oscillator operating at 10 MHz frequency. What should be the magnetic field applied for accelerating protons? If the radius of the dees is 60 cm, what is the kinetic energy of the proton beam produced by the cyclotron?
29. At what distance from a long straight wire carrying a current of 12 A will the magnetic field be equal to $3 \times 10^{-5}$ $Wbm^{-2}$ ?
30. A rod of magnetic material 0.5 m in length has a coil of 200 turns wound over it uniformly. If a current of 2 A is sent through it, calculate (i) the magnetising field (ii) the intensity of magnetisation (iii) magnetic induction and (iv) the relative permeability of the material. Given $\chi_m = 6 \times 10^{-3}$ .
31. At the interface between one linear magnetic material and another, the magnetic field lines bend. Assuming that there is no free current at the boundary, show that
    $\tan \theta_1 / \tan \theta_2 = \mu_1 / \mu_2$ , where $\theta_1$, $\theta_2$ are angles through which the lines bent in medium 1 and 2 respectively ; $\mu_1$ , $\mu_2$ are the permeabilities of the two media

**(4 × 4 = 16 marks)**

## SECTION E

**(Essays – Answer in about two pages)**

**(Answer any TWO questions. Each question carries 10 marks)**

2. State Gauss's law in electrostatics. Applying the law, find the intensity of electric field due to (i) a charged cylindrical conductor and (ii) an infinite plane sheet of charge.
3. Derive the expression for the work done to move a charge. Hence find the work done to assemble a collection of point charges.
4. What are linear dielectrics? Derive an expression for the energy stored in a dielectric system.
5. Starting from Biot-Savart law, derive the expression for the magnetic field due to a long straight conductor carrying a steady current.

**(2 × 10 = 20 marks)**