1B4A24215 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester B.Sc Degree Examination, April 2024

BPH4C04 – Electricity, Magnetism & Nuclear Physics

(2022 Admission onwards)

Time: 2 hours Max. Marks : 60

The symbols used in this question paper 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. Explain the Meisner effect.
2. Differentiate retentivity and coercivity.
3. Differentiate between primary and secondary cosmic rays.
4. State the law of radioactive disintegration.
5. State Gauss theorem in electrostatics.
6. Define electric potential and potential difference
7. Which are the fundamental interactions of nature? What is their range?
8. Write an expression for the capacitance of a cylindrical capacitor and explain the terms.
9. Distinguish between nuclear fission and fusion.
10. Distinguish between leptons and hadrons
11. Define curie.
12. Define half-life of a radioelement.

(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. With the help of diagram, explain the conversion of a galvanometer to an ammeter.
14. Prove that half-life of radioactive disintegration is inversely proportional to decay constant
15. The half-value period of radium is 1590 years. In how many years will one gram of pure element (a) loose one centigram, and (b) be reduced to one centigram?
16. Obtain an expression for finding the moment of a bar magnet using deflection. magnetometer in Tan A position.

17. A copper wire of diameter 0.5mm and length 20m is connected across a battery of emf 1.5V and internal resistance 1.25 . Calculate the current density in the wire. Given atomic weight of copper = 63.54.
18. Calculate the binding energy of an alpha particle and express the result both in MeV and joules.
19. Discuss the lepton and baryon number conservation laws giving an example for each.

(Ceiling 30 marks)

SECTION C-Essay type

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

20. With the help of a neat diagram, explain the construction and working of a Searle's vibration magnetometer
21. Describe the construction, working and applications of a nuclear reactor .

(1x10=10 marks)

22

1B4A24214 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester B.Sc Physics Degree Examination, April 2024

BPH4B04 – Electrodynamics – II

(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)

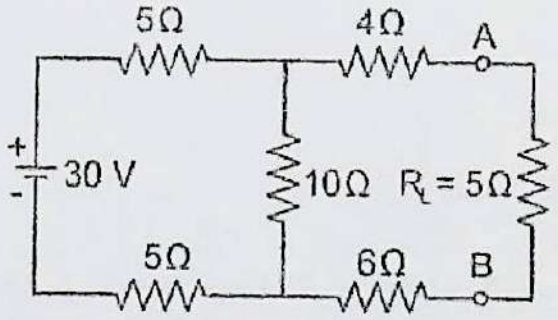
1. What do you mean by motional emf ?
2. State Thevinin's theorem.
3. Write down integral form of Faraday's law and explain the terms involved.
4. Discuss the procedures involved in converting a current source to a voltage source with a suitable circuit diagram.
5. What do you mean by mutual induction and define mutual inductance ?
6. Write down the expression for the momentum carried by an electromagnetic wave and explain the terms.
7. Write down Maxwell's equations.
8. Define maximum power transfer theorem.
9. Define Kirchhoff's laws.
10. Define the self-inductance in terms of the magnitude of induced emf in a that coil.
11. Write down the expression for charge in a series LR network when the circuit is switched off.
12. Define polarization current density?

(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. Explain Poynting vector and obtain an expression for it using the expression for the energy density of an electromagnetic wave.
14. A resistance of 100Ω and a capacitance of 100 mH are connected in series across a direct voltage of 200V suddenly. Find the voltage drop across the capacitor at the instant of switching on and at 0.01 second after switched on.
15. Obtain the expression for magnetic energy in terms of the intensity of the magnetic field.
16. Show that electric and magnetic field variations constitute wave motion.
17. Find the boundary condition for the magnetic field across a boundary carrying a surface current k.
18. In the network shown in figure, calculate the current through the load resistor R_L by using Norton's Theorem.



19. Obtain the expression for charge sensitivity of a BG.

(Ceiling- 30)

Section C- Essay Type

Answer any one question. Answer carries 10 marks

20. Explain the resonance in a series LCR circuit.
21. Discuss the reflection coefficient and transmission coefficient when an electromagnetic wave is incident normally on a boundary between two dissimilar media.

(1x10= 10)

1B4A24203 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester B.Sc Chemistry, Physics & Statistics Degree Examination, April 2024

BMT4C04 – Mathematics – 4

(2022 Admission onwards)

Time: 2 hours Max. Marks : 60

Section A
All questions can be attended
Each question carries 2 marks

1. Verify that $y = x^2$ is a solution of the differential equation $xy' = 2y$ for all x.
2. Solve the differential equation $9yy' + 4y = 0$
3. Is the differential equation $(x^3 + 3xy^2)dx + (3x^2y + y^3)dy = 0$ is exact?
4. What is mean by general and particular solution of a differential equation?
5. State existence and uniqueness theorem for initial value problem
6. Find Wronskian of the functions e^x and $x\,e^x$
7. Find the characteristic equation and characteristic roots of the differential equation $y'' + y' - 2y = 0$
8. Find the general solution to the differential equation $y'' - y = 0$
9. If $f(t) = 1, t \geq 0$, find $F(S)$.
10. If $f(t) = \sin^2 t$, find $\mathcal{L}(f)$
11. State second shifting theorem.
12. Write two examples of odd functions.

Section B
All questions can be attended
Each question carries 5 marks

13. Solve the linear differential equation $y' - y - e^{2x} = 0$
14. Find the orthogonal trajectories of the family of curves $y = cx^2$
15. Solve the initial value problem $y'' - 4y' + 4y = 0, y(0) = 3, y'(0) = 1$
16. Solve the non-homogeneous equation $y'' + 4y = 8x^2$
17. Let $\mathcal{L}(f) = \frac{1}{s(s^2+\omega^2)}$. Find $f(t)$
18. Find the inverse transform of the function $\ln\left(1 + \frac{\omega^2}{s^2}\right)$
19. Solve the differential equation $y'' - 4y = 2e^{3t}, y(0) = 1, y'(0) = 1$ using Laplace transforms.

Section C
Answer any one question
Question carries 10 marks

20. Find an integrating factor and solve the initial value problem

$2\sin(y^2)\,dx + xy\cos(y^2)\,dy = 0, y(2) = \sqrt{\frac{\pi}{2}}$. Find a particular solution.

21. Find the Fourier coefficients and series of the periodic function $f(x)$ given by,

$$f(x) = \begin{cases} -k, & -\pi < x < 0 \\ k, & 0 < x < \pi \end{cases} \text{ and } f(x + 2\pi) = f(x)$$