NIMMETRY

Class Test, First Semester, 2021 Course: Basic Electricity and Electrical Circuits (PHY 1211) Dept. of CSE, University of Rajshahi

Time: 30 minutes

Marks: 15

Answer any ONE from each question

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\frac{1}{2}	(b) (a)	Draw and define an electric dipole. Which type of charge distribution is Gauss's formula useful for? Write down the equations for the electric field due to a point charge and a dipole. Mention and explain the cause(s) of differences but	3
	(b)	The state of the s	3
	(4)	Find the expression for the electric field inside a spherical shell of charge with radius R and total charge q .	3
X	(a)	Derive an expression for the torque exerted on an electric dipole placed in an electric field.	5
	(b)	Find the expression for the magnitude of electric field inside a uniform sphere of charge.	5
A	(a)	A neutral water molecule (H ₂ O) of electric dipole moment 6.2×10^{-30} C.m is placed in an electric field of 1.5×10^4 N/C. What maximum torque can the field exert on	4
	(b)	it? A particle of charge $+q$ is placed at one corner of a Gaussian cube. What multiple of q/ϵ_0 gives the flux through each cube face forming that corner?	4

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Class Test 03, First Semester, 2021 Course: Basic Electricity and Electrical Circuits (PHY 1211) Dept. of CSE, University of Rajshahi Time: 30 minutes; Marks: 16 Inswer any ONE question. State and explain Ampere's law. Is Ampere's law suitable to use for all types of current distribution? Justify your (a) (b) A long, straight wire of radius R carries a steady current I that is uniformly distributed through the cross section of the wire. Calculate the magnetic field a distance (c) r from the center of the wire in the regions r > R and r < R. Show that the charge on the capacitor in an RC circuit increases according to q =(a) Define capacitive time constant and show that it has the dimension of time. A capacitor of capacitance C that is being discharged through a resistor of resistance R. After how many time constants is the charge on the capacitor one-fourth its initial (b) (c) value? State and explain Faraday's law of induction. (a) Explain Lenz'z law. A coil consists of 200 turns of wire. Each turn is a square of side d 5 18 cm, and a Define self and mutual induction. (b) uniform magnetic field directed perpendicular to the plane of the coil is turned on. (b) If the field changes linearly from 0 to 0.50 T in 0.80 s, what is the magnitude of the (c) induced emf in the coil while the field is changing? 1.

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Time: 30 minutes

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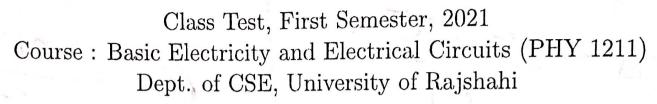
Answer any ONE from each question

1	(a)	Draw and define an electric dipole.
	(b)	Which type of charge distribution is Gauss's formula useful for?
2	(a)	Write down the equations for the electric field due to a point charge and a dipole.
		Mantion and explain the cause(s) of difference between two equations.
	(b)	Find the expression for the electric field inside a spherical shell of charge with radius
	` '	
3	(a)	R and total charge q . Derive an expression for the torque exerted on an electric dipole placed in an electric.
	(b)	field. Find the expression for the magnitude of electric field inside a uniform sphere of
		charge. (T. 0) full strip dipole moment 6.2×10^{-30} C.m is placed
4	(a)	charge. A neutral water molecule (H ₂ O) of electric dipole moment 6.2×10^{-30} C.m is placed in an electric field of 1.5×10^4 N/C. What maximum torque can the field exert on
•	(- /	in an electric field of 1.5×10^{-1} N/C. What maximum 33.1
		it? A particle of charge $+q$ is placed at one corner of a Gaussian cube. What multiple 4.
	(b)	A particle of charge $+q$ is placed at one corner of a statement of a statement of the corner?
		A particle of charge $+q$ is placed at one corner of q/ϵ_0 gives the flux through each cube face forming that corner?

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ime: 30 minutes; Marks: 15 Answer question 1 and any one from 1 - 3.

> What is the mean free time τ between collisions for the conduction electrons in copper? (conduction electron density and resistivity in copper are $8.49 \times 10^{28} \text{ m}^{-3}$ copper, assuming that their effective speed 1.6×10^6 m/s.

- and $1.69 \times 10^{-8} \Omega$ m). What is mean free path for the conduction electrons in Discuss the effect of dielectric on the capacitance. (a)
- Discuss the effect of dielectric on the electric field. (b)
- Derive Gauss's law with dielectrics. (a)
- Explain the electron theory of conductivity and derive the equation $\rho = \frac{m}{ne^2\tau}$. (b)
- Why are small units used instead of Farad? (a)
- Define current and current density. (b)