

NORTH GAUHATI COLLEGE

DEPARTMENT OF PHYSICS

ONLINE SESSIONAL EXAMINATION, 2021

Semester 2nd (H), Paper: Electricity & Magnetism, PHY-HC-2016

Max Marks-20

Date: 29th October, 2021

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- 1) Answer the following questions : 1×5=5
- a) Write down the inverse square law in Electrostatics.
 - b) Define force in terms of potential.
 - c) Write down the expression of magnetic flux density at the center of a long solenoid carrying current.
 - d) Express 'Henry' in terms of fundamental quantities (M, L, T, I).
 - e) If a sinusoidal voltage is applied across a resistor, show that voltage and current are in phase.
 - f) What is the difference between 'dead-beat galvanometer' and 'ballistic galvanometer'?
- 2) Answer any three of the following : 3×5=15
- a) Using Gauss's law to determine the electric field for a uniformly charged spherical conductor.
 - b) A current $i(t) = 2e^{-t} - e^{-2t}$ μA charges up a 120 nF capacitor for a period of 2s. If the final voltage across the capacitor is 15 V, what is the initial voltage across it?
 - c) Derive an expression for the electric field and potential at a point due to an electric dipole.
 - d) Obtain an expression for the power factor of an a.c. circuit? Explain the term 'wattless current'.
 - e) What is meant by resonance in an a.c. circuit? In an a.c. circuit containing L, C and R in series, find the condition under which the resonance is obtained.
 - f) A coil of resistance 10 Ω and inductance 0.1 H is connected in series with a capacitor with capacitance 150 μF across a 200 V (r.m.s), 50 Hz supply. Calculate the power factor and power consumed in the circuit.

Nota Bene:

- Write your answers in A4 paper sheet mentioning clearly **your name, GU roll number, registration number, paper code etc.** at the front page of your answer sheet.
- You have to make a single PDF file of your answer sheets.
- You need to submit your respective PDF at the online portal of our college website ONLY.
- The submission deadline is 29th October, 2021 (23.59 hrs).