Reg. No…….. Name…… **19U420**

B.Sc. DEGREE END SEMESTER EXAMINATION MARCH/APRIL 2019

SEMESTER **– 4: PHYSICS (CORE COURSE)**

COURSE: **15U4CRPHY4 – ELECTRICITY AND ELECTRODYNAMICS**

(Common for Regular 2017 admission and improvement 2016/ supplementary 2016/2015/2014 admission)

Time: Three Hours Max. Marks: 60

PART A (Very short answer questions)

*Answer **all** questions. Each question carries **1** Mark*

1. What are transient currents?
2. Define Ballistic reduction factor.
3. How does sparking occur?
4. Define the form factor of ac.
5. Write the Poisson's and Laplace's equations.
6. State Gauss's law and hence write its differential form.
7. What is Lorentz force?
8. Give the wave equation for transverse waves on a string and write the expression for its speed.

(1 x 8 = 8)

PART B (Short answer)

*Answer **any Six** questions. Each question carries **2** Marks*

9. State and explain Poynting Theorem.
10. Explain the expression for the growth of current in an L-R circuit and obtain the graphical variation.
11. Explain the Q factor of a series LCR circuit and obtain its expression.
12. Obtain Coulomb's law from Gauss's law.
13. Derive the expression for the energy density of a parallel plate capacitor.
14. Find the work done by a magnetic force and give its implication.
15. Explain the Ampere's circuital law in differential form.
16. Write down the energy and momentum of electromagnetic waves. (2 x 6 = 12)

PART C (Problem/Derivations)

*Answer **any Four** question. Each question carries **5** Marks*

17. Derive impedance of a series LCR circuit.
18. A capacitor of capacitance 4μf is discharged through a resistance. The time taken for half the charge on the capacitor to leak is found to be 10 seconds. Compute the value of the resistance.
19. A battery of emf 100 volts is connected in series with an inductance of 10mH, a capacitor of 0.05 μf and a resistance of 100 ohms. Determine whether the circuit is a) oscillatory and b) the frequency of oscillation if it is oscillatory.
20. Derive the electric field due to a uniformly charged wire of linear charge density λ.

21. A conducting sphere of radius 10cm is given a uniform charge distribution of $4X10^{-9}C$. Find the electric potential and field at a) any internal point and b) at a point outside 20cm away from the centre of the sphere.
22. Derive the electrostatic and magnetostatic boundary conditions across a conducting surface.

(5 x 4 = 20)

PART D (Long answer questions)

*Answer **any Two** question. Each question carries **10** Marks*

23. With necessary theory, circuits and graph discuss the charging of a capacitor through a resistance and inductance and discuss the special cases.
24. Determine the electric potential due to a uniformly charged spherical conductor of radius 'R' at an (i) external point r>R (ii) at an internal point r<R. Also plot the variation of |V| as a function of |r|.
25. Obtain Maxwell's equations from fundamental laws in electrostatics and magnetostatics and explain the equations when applied to polarized matter.
26. With necessary theory, discuss the propagation of electromagnetic waves in conductors and arrive at the wave equations for E and B. (10 x 2 = 20)

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