TB144440B **Reg. No: ……..**

Name: ……..

B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2017
(Supplementary – 2014 Admission)
SEMESTER IV – CORE COURSE (PHYSICS)
PHY4EE - ELECTRICITY AND ELECTRODYNAMICS

Time: Three Hours **Maximum Marks: 60**

PART A

I. Answer all questions. Each question carries 1 mark.

1. State and explain Thevenin's theorem.
2. What is capacitative reactance?
3. What is meant by logarithmic decrement of a B.G.?
4. What are the electrostatic boundary conditions at the interface between two dielectics?
5. Derive the expression for the curl of an electrostatic field.
6. Give Poisson equation and Laplace equation.
7. What are scalar and vector potentials? Explain.
8. Write down electromagnetic wave equations in a conducting medium.

(8x1=8)

PART B

II. Answer any six questions. Each question carries 2 marks.

9. Define time constant. What is the time constant for an LC circuit?
10. What is power factor for an AC circuit? Derive the power factor of an LCR circuit**.**
11. Distinguish between accepter circuits and rejector circuits.
12. Prove that the current in an inductance lags behind the applied e.m.f. by $\pi/2$.
13. State and explain Gauss's law in electrostatics. Deduce the point form of Gauss's law.
14. Give a comparison of electrostatics and magnetostatics on the basis of Maxwell's equations.
15. Give Ampere circuital theorem in point form. Explain why Maxwell modified Ampere circuital theorem.
16. Define electrostatic potential. Graphically indicate the variation of potential due to a uniformly charged spherical shell with distance.
17. Derive the expression for the work done in charging a capacitor.
18. Derive the expression for energy and momentum of electromagnetic waves.

(6x2=12)

PART C

III. Answer any four questions. Each question carries 4 marks.

19. A coil of inductance 20 mH and resistance 10 ohm is connected to a 210 V, 50 Hz alternating e.m.f. Find the impedance, current and phase difference between e.m.f. and current in the circuit.

20. A 5 μF capacitor is connected to a cell of e.m.f. 1.5 V and internal resistance 1.2 ohm. Find the potential difference between the plates after 3 μS.
21. When 10^{-8} C charge is passed through a B.G. the throw is 15cm. If the period of oscillation is 6 s find the current required for a steady deflection of 20cm.
22. Find the electrostatic field intensity E at (1,1,0) if the scalar electric potential is given by $V = E_0 e^{-x} \sin(\pi y/4)$.
23. A charged oil drop of radius 1.3×10^{-6} m is prevented from falling under gravity when it is placed between two horizontal plates charged to a potential difference of 8340 volts. The distance between the plates is 1.6×10^{-2} m and the density of oil is 9.2×10^{3} kg/m^3. Find the charge on the drop.
24. Obtain the plane wave solutions of one dimensional wave equation.

(4x4=16)

PART D

IV. Answer any two questions. Each question carries 12 marks.

25. An inductance , capacitance and resistance are connected in series across an alternating e.m.f. Calculate the current in the circuit. Explain resonance in L-C-R circuit.
26. What is Poynting's vector? State and prove Poynting's theorem.
27. What is the work done in moving a charge in an electrostatic field? Derive the expression for the energy of a point charge distribution.
28. Derive electromagnetic wave equations in conductors. Give the plane wave solutions of the wave equations and derive the expression for skin depth.

(2x12=24)