15U506 (Pages: 3) Name: ……

Reg.No……

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, OCTOBER 2017

(CUCBCSS-UG)

Physics- Core Course

CC15U PH5 B06 - ELECTRODYNAMICS - II

(2015-Admission)

Time: Three Hours Maximum: 80 Marks

Section A

(Answer ***all*** questions. Each question carries 1 mark***)***

1. The energy density of an electromagnetic wave in free space is given by _____
2. The non existence of magnetic monopoles is given by the Maxwell's equation ____
3. Current in an LR circuit decays as _____
4. The power factor of an ac circuit is given by _____
5. Kirchoff's first law is law of conservation of _____

Write True or False:-

6. Displacement current is due to change in electric field.
7. Electromagnetic waves have same velocity in all transparent media.
8. For highly sensitive ballistic galvanometer, its charge sensitivity is smaller.
9. With increase in frequency of an ac supply, the impedance of an LCR series circuit decreases.
10. While thevenizing a circuit between two terminals, Thevenin's voltage equals the net voltage available in the circuit.

(10 x 1 = 10 Marks)

Section B

(Answer ***all*** questions. Each question carries **2** marks***)***

11. How Lenz's law is the consequence of the principle of conservation of energy?
12. Define Poynting vector.
13. What is meant by monochromatic plane wave?
14. What is meant by figure of merit of a galvanometer?
15. What is the significance of j operator?
16. State and explain maximum power transfer theorem.

Turn Over

17. Obtain Faraday's law in differential form.

(7 x 2 = 14 Marks)

Section C

(Answer ***any five*** questions**.** Each question carries **4** marks***)***

18 Explain how Maxwell modified Ampere's law. Explain the importance of the new term.

19 Obtain an expression for the energy per unit volume in a magnetic field.

20 Show that electromagnetic waves are transverse. Also show that the electric and the magnetic fields are in phase and mutually perpendicular.

21 Starting from Maxwell's equations, show that electric field and magnetic field can propagate in free space as a wave.

22 Explain when a LCR circuit is said to be damped oscillatory.

23 Derive the phase relationship between E and I in an a.c. circuit containing C and R.

24 How will you Nortonize a given circuit?

(5 x 4 = 20 Marks)

Section D

(Answer ***any four*** questions. Each question carries **4** marks***)***

25 50pF capacitor is getting charged at such a rate that its voltage is increasing at 300V/s. The plates are circular with radius 10cm. Calculate the displacement current density and magnetic induction at a distance of 5cm from the axis of the capacitor in the space between the plates.

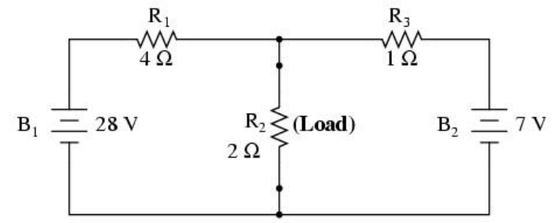
26 A solenoid of length 30cm and area of cross section $10cm^2$ has 1000 turns wound over a core of constant permeability 600. Another coil of 500 turns is wound over the same coil at its middle. Calculate the mutual inductance between them.

27 In a plane electromagnetic wave the electric field oscillates sinusoidally at a frequency 2×10^{10}Hz and amplitude 48V/m. Find out the wavelength of the wave and the amplitude of the oscillating magnetic field.

28 A resistance R and a capacitor $2\,\mu F$ in series are connected to a 200V direct supply. Across the capacitor a neon lamp is connected that strikes at 100V. Calculate the value of R to make the lamp strike four seconds after the switch has been closed.

29 A circuit consists of a non inductive resistance of 50Ω, an inductance of 0.3H, and a resistance of 2Ω and a capacitor of $40\,\mu F$ in series and is supplied with 200V at 50Hz. Find the impedance, the current and the power in the circuit.

30 Find the Thevenin's equivalent circuit of the network shown.



31 A plane electromagnetic wave of frequency 10^9Hz, while travelling in air, has peak electric field intensity of 1V/m. If this wave be incident normally on a large sheet of copper, find the average power absorbed per square meter of the sheet. ($\rho = 1.7 \times 10^{-8}\ \Omega m$)

(4 x 4 = 16 Marks)

Section E

(Answer ***any two*** questions. Each question carries 10 marks***)***

32 Derive the Maxwell's equations inside a polarized matter.

33 Obtain expressions for reflection coefficient and transmission coefficient for normal incidence of electromagnetic wave on a surface separating two dielectric media.

34 Describe with theory how will you determine the self inductance of a coil using Anderson's bridge.

35 Give the construction of a moving coil ballistic galvanometer. Derive the relation between the quantity of charge flowing through it and the throw obtained. Show how to correct the observed throw for damping.

(10 x 2 = 20 Marks)

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