**20U506S** (Pages: 2) Name ……..…..

Reg. No ……...…….

**FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2022**

(CUCBCSS-UG)

**CC15U PH5 B06 – ELECTRODYNAMICS – II**

(Physics – Core Course)

(2015 to 2018 Admission – Supplementary/Improvement)

Time: Three Hours Maximum: 80 Marks

## SECTION A

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

1. Maxwell's equation derived from Faraday's law is given by _____
2. Lenz's law is a consequence of the law of conservation of _____
3. In a RC circuit time constant is given by _____
4. Kirchoff's first law is law of conservation of _____
5. A parallel resonant circuit is also known as _____
6. The electromagnetic waves travel in vacuum with a velocity equals to _____
7. In the operation by j operator a vector rotates through _____ angle in _____ direction.
8. State Maximum power transfer theorem.
9. Define current sensitivity of a BG.
10. What is Wattless current?

**(10 × 1 = 10 Marks)**

## SECTION B

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

11. Which are the four Maxwells's equations?
12. State Faraday's law of electromagnetic induction.
13. What type of currents is considered as transient?
14. State and explain Thevenin's theorem.
15. What is meant by figure of merit of a galvanometer?
16. What is the significance of j-operator
17. What is meant by polarization vector? What is its significance?

**(7 × 2 = 14 Marks)**

## SECTION C

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

18. Derive boundary conditions for the field vectors **E, B, D, H**
19. Obtain expression for the growth and decay of charge in a capacitor through a resistance.
20. State and explain superposition theorem and Nortons's theorem.
21. Derive the Neumann formula for mutual inductance.
22. Derive the expression for energy density and momentum density of an electromagnetic wave.

23. Write down and explain the Maxwell's modified Ampere's law.
24. Explain with the help of a neat diagram Rayleigh bridge method to measure the self inductance of a coil.

**(5 × 4 = 20 Marks)**

## SECTION D

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

25. A solenoid of 75 cm length and 5 cm diameter is wound with 1000 turns. Find (a) Inductance (b) The energy stored in the magnetic field when a current of 5 A flows in the coil.
26. A parallel plate capacitor with circular plates of radius 2cm is charged. If the change in electric field is $10^{10}$ V/m.s, Calculate the displacement current.
27. A condenser of capacity 0.5 μF is discharged through a resistance of 10 mega ohms. Find the time taken for half the charge on the condenser to escape.
28. A circular coil of 30 turns and radius 8 cm carrying a current of 6A is suspended vertically in a uniform magnetic field of magnitude 1 T. the field lines make angle of $60^{o}$ with the normal to the coil. Calculate the magnitude of the counter torque that must be applied to prevent the coil from turning.
29. The current sensitivity of a ballistic galvanometer is $2.5 \times 10^{-9}$ ampere for a deflection of 1mm on a scale kept at a distance of 1 metre. Calculate the charge sensitivity of the galvanometer if time period of the coil is 6.28 second.
30. A coil having an inductance of 0.7H is joined in series with a resistance of 50Ω. Calculate the current flowing in the circuit. The applied voltage is 200V at 50 cycles. What is the phase angle?
31. A resistance of 20Ω an inductance of 0.2H and a capacitance of 100μF are connected in series across 220V, 50Hz mains. Determine the following
    i. Impedance
    ii. Current
    iii. Voltage across R, L and C
    iv Power factor and angle of lag

**(4 × 4 = 16 Marks)**

## SECTION E

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

32. From Maxwell's equations obtain plane wave solution for the electromagnetic waves in free space and show that the waves propagate with the speed of light.
33. Derive an expression for inductance of a
    i. Solenoid
    ii. Toroid
34. State and explain Poynting theorem. Show that the Poynting vector can be expressed as $\boldsymbol{P = E \times H}$
35. Describe the experimental method for determining high resistance by leakage method.

**(2 × 10 = 20 Marks)**

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