

D 90912

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Name.....

Reg. No.....

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2015

(U.G.—CCSS)

Core Course—Physics/Applied Physics

PH 5B 09/AP 5B 11—ELECTRODYNAMICS—II

(2009—2012 Admissions)

Time : Three Hours

Maximum : 30 Weightage

**Answer all**

- The concept of displacement current was a major contribution attributed to :  
(a) Faraday. (b) Lorentz,  
(c) Maxwell. (d) Lenz.
- Electromagnetic waves travel \_\_\_\_\_ in dielectrics than in conductors.
- In a good conductor \_\_\_\_\_ are \_\_\_\_\_.
- The rms value of a sinusoidal current is equal to its value at an angle of :  
(a) 60 degree. (b) 90 degree.  
(c) 30 degree (d) 45 degree.
- When harmonics of a fundamental sine wave are added to it we get a :
- Skin effect at high frequencies can be neutralized by using conductors made of :
- In one time constant, the current through an RL circuit decreases by :  
(a) 69%. (b) 14.14%.  
(c) 63%. (d) 70.7%.
- According to KVL, the algebraic sum of all IR drops and emfs in any closed loop of a network is always :  
(a) Zero. (b) Positive.  
(c) Negative. (d) Greater than unity.
- The superposition theorem is essentially based on the concept of :  
(a) Reciprocity. (b) Duality.  
(c) Linearity. (d) Non linearity.
- In a capacitance the EMF lags behind the current by :  
(a) 30°. (b) 60°.  
(c) 90°. (d) 180°.

Turn over

11. A pulse of electromagnetic radiation can be produced by :

- (a) Acceleration of a charge.
- (b) Charge moving with steady velocity.
- (c) Slow variation of current in a conductor.
- (d) All the above.

12. The self inductance of a coil is measured using :

- (a) Metre bridge.
- (b) Potentiometer.
- (c) Wheatstone's bridge.
- (d) Anderson bridge.

(12 × ¼ = 3 weightage)

### Part B

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

- 13. What are non-inductive coils ?
- 14. Define attenuation constant.
- 15. Explain polarization of EM waves.
- 16. What are the steps to be taken while applying the superposition theorem to the solution of networks ?
- 17. What is skin effect ? How is it minimized ?
- 18. What is inductive reactance and capacitive reactance ?
- 19. Define virtual ampere and virtual volt.
- 20. State and explain Kirchoff's current law.
- 21. Explain operator  $j$  and show it graphically.

(9 × 1 = 9 weightage)

### Part C

*Answer any five.*

- 22. Prove that magnitude of the induced emf is equal to the rate of change of induction in a closed circuit.
- 23. Obtain expressions for the growth and decay of the charge of a condenser through a resistance. Under what condition is the discharge of the condenser oscillatory ?
- 24. A condenser of capacity 0.5 MF is discharged through a resistance of 10 megohms. Find the time taken for half the charge on the condenser to escape.
- 25. Derive an expression for the energy stored in an inductance. Calculate the energy of an inductor having an inductance of 60mH when a current of 2A flows through it.
- 26. In a plane em wave the electric field oscillates sinusoidally at a frequency of 20 mHz and amplitude 48V/m. What is the wavelength of the wave ? What is the amplitude of the oscillating magnetic field ?

27. The self-inductance of a coil is 3.0 mH. A current of 5A flows through it. The current is reduced to zero in 0.1s when switched off. Calculate the induced emf.
28. Calculate the force of repulsion between a coil carrying a.c. and a neighbouring conductor.  
(5 × 2 = 10 weightage)

### Part D

*Answer any two.*

29. Derive Biot- Savart's Law and Ampere's law using the concept of magnetic vector potential.
30. Derive Maxwell's equations in an isotropic dielectric medium.
31. Derive expressions for the electric field component and magnetic field component for the reflection of a plane wave.
32. State and prove : (a) Superposition theorem ; (b) maximum power transfer theorem.

(2 × 4 = 8)