

Roll No. 21312300020

Exam Code : J-22

Subject Code—56812

B. Sc. EXAMINATION

(Batch 2018 Onwards)

(Main & Re-appear)

(Second Semester)

PHYSICS

CPL-203

Electricity, Magnetism and EMT-II

Time : 3 Hours

Maximum Marks : 80

Note : Q. No. 1 is compulsory. Out of remaining eight questions (divided in 4 Units), attempt *four* questions by selecting either *one* question from each Unit or by selecting *two* questions from any one Unit and remaining *two* questions from two different Units out of remaining three Units. Non-programmable calculator is allowed.

(1-09-36-0622) J-56812

P.T.O.

(Compulsory Question)

1. ~~(a)~~ Define self inductance and define its S.I. Unit. 2
- (b) What is difference between resistance and capacitive reactance of a capacitor ? 2
- ~~(c)~~ What is physical significance of $\vec{\nabla} \cdot \vec{B} = 0$ equation ? 2
- ~~(d)~~ Define poynting vector and give its physical significance. 2
- ~~(e)~~ Write electromagnetic wave equation in term of magnetic vector. 2
- ~~(f)~~ Write Gauss law of electrostatics in integral form. 2
- (g) Define Vector Potential. 2
- ~~(h)~~ What is Coulomb Gauge-Transformation ? 2

Unit I

2. (a) Define mutual inductance and its S.I. unit. Prove reciprocity relation ($M_{12} = M_{21}$) for mutual inductance. 8

- (b) Find energy stored in magnetic field of a long solenoid of self inductance 20 mH when 2A current is flowing through it. 8
- ~~3.~~ Define resistance, inductive reactance, capacitive reactance and impedance. Derive relation between these four quantities in case of series LCR circuit by using complex variables for circuit analysis. Discuss phase relation of these four quantities with alternating current through the circuit. 16

Unit II

4. ~~(a)~~ Discuss Maxwell's modification of Ampere Circumstance Law. What is displacement current. What conclusions we can drawn from modified Ampere-Maxwell's Law ? 10
- ~~(b)~~ The peak value of electric vector (E_0) of a plane radio wave is $3 \times 10^{-4} \text{ Vm}^{-1}$. Calculate peak value (B_0) of its magnetic vector. 6

5. ~~(a)~~ Derive the four Maxwell's equation in a material. 10

~~(b)~~ Discuss the equation of continuity for electric current and derive it. 6

Unit III

6. (a) Derive relation for energy per unit area per unit time and momentum of EM wave. 8

(b) What are characteristics of EM wave ? 8

7. Discuss reflection along and transmission of EM wave falling normal to a plane surface of transparent medium. Derive relations for coefficient of reflected energy and coefficient of transmitted energy. 16

Unit IV

8. Derive transformation equation for electric vector from one inertial frame of reference FOR to other FOR moving with constant relative velocity. 16

~~8.~~ What types these

Q. What are Gauge Transformations ? Discuss two types of Gauge Transformations and compare these transformations. 16

J-56812

5

1,570