

B.Sc. Semester - 5 (CBCS) Examination
December - 2020 (Old Course)
ELECTRODYNAMICS AND RELATIVITY (CORE)

Time: 1:30 Hours

Marks: 42

Instructions:

1. Figures to the right indicate marks.
2. There are five questions in the question paper.
3. Answer any three of the following questions.

Q.1(A) Answer the following (Any one out of two) (07)

1. Discuss on detail the Maxwell's modification to the Ampere's law of magnetostatics.
2. Discuss in detail the Maxwell's stress tensor.

Q.1(B) Attempt any one (out of two) (04)

1. Explain the self and mutual inductances.
2. Explain the validity of Network's third law of motion in context of Electrodynamics

Q.1(C) Attempt any three (out of five) (03)

1. Write the unit of permeability of free space in SI system of units.
2. Write the equation of Poynting's vector.
3. What is the equation for the total energy stored in the Electrostatic field in term of electric field.
4. What is the unit of Mutual inductance.
5. Write the continuity equation.

Q.2(A) Answer the following (Any one out of two) (07)

1. Write detailed about the reflection and transmission of waves in context of Electromagnetic waves.
2. Write detailed note about the energy and momentum in Electromagnetic waves.

Q.2(B) Attempt any one (out of two) (04)

1. Explain Polarization of Electromagnetic waves.
2. Check whether the following functions qualify to represent waves.

$$f_1(z, t) = A e^{-b(z-vt)^3}$$

$$f_2(z, t) = A \sin[b(z-vt)]$$

$$f_3(z, t) = \frac{A}{b(z-vt)^2 + 1}$$

$$f_4(z, t) = A e^{-b(bz^2 + vt)}$$

Q.2(C) Attempt any three (out of five) (03)

1. Explain the terms, Phase, frequency and amplitude of wave
2. Write Euler formula for the complex notation.
3. Any wave can be expressed as the linear combination of the sinusoidal waves. Is this statement true or false?
4. Write the three dimensional form of wave equation.
5. Micro-waves have higher frequencies than that of visible range electromagnetic waves. Is the statement true or false?

Q.3(A) Answer the following (Any one out of two) (07)

1. Give detailed note on the field of the moving charge.
2. Give detailed note on the Retarded potentials.

Q.3(B) Attempt any one (out of two) (04)

1. Explain the Coulomb and Lorentz Gauge transformations.
2. Explain the Jefimenko's equations of fields.

- Q.3(C) Attempt any three (out of five) (03)
1. How the electric field is given in terms of potentials in electrodynamics.
 2. According to the Lienard-Wiechert potentials for moving point charge, how the vector and scalar potentials are related? Write the equation.
 3. Using Lorentz gauge, give equation in which the V and A can be treated on same footing by d'Alembertian
 4. What is retarded time and advance time?
 5. How electric potential is different than retarded electric potential in electrodynamics
- Q.4(A) Answer the following (Any one out of two) (07)
1. Write detailed note on power radiated by a point charge
 2. Write detailed note on the radiation from the arbitrary source.
- Q.4(B) Attempt any one (out of two) (04)
1. Discuss the physical basis of radiation reaction.
 2. Discuss the magnetic dipole radiation.
- Q.4(C) Attempt any three (out of five) (03)
1. Define an electric dipole.
 2. Define a magnetic dipole.
 3. What is radiation zone?
 4. Write the equation of Larmor formula
 5. Charges must be in accelerated motion in order to produce the radiation. The statement is true or false?
- Q.5(A) Answer the following (Any one out of two) (07)
1. Give detailed note on Relativistic Kinematics
 2. Give detailed note on Relativistic Dynamics
- Q.5(B) Attempt any one (out of five) (04)
1. Discuss the structure of space-time
 2. Discuss the proper time and Proper velocity
- Q.5 (C) Attempt any three (out of five) (03)
1. Write equation of the Lorentz transformation of time.
 2. Can any material body in free space exceed the speed of light in vacuum?
 3. What is Galilean transformation of space coordinate the body moving w. r. t to two inertial reference frames?
 4. Give the equation of Lorentz contraction.
 5. Give the equation of time dilation.
