

B.Sc. Semester - 5 (Remedial) (CBCS) Examination
Feb/Mar. -2021 (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.

1(a) Answer the following question (any one). (7)

- (1) discuss: Energy in magnetic field.
- (2) Explain Maxwell's stress tensor.

1(b) Answer the following question (any one). (4)

- (1) Explain motional emf and prove flux rule..
- (2) Explain: Newton's third law in electrodynamics.

1(c) Answer the following question (any three). (3)

- (1) Give the SI unit of electric charge.
- (2) Write Neumann formula.
- (3) Write an equation of Ampere's law in differential form.
- (4) Give the SI unit of current density.
- (5) In electromagnetic field, the angular momentum, L_{em} =

2(a) Answer the following question (any one). (7)

- (1) Derive wave equation.
- (2) Explain boundary conditions of electromagnetic waves for reflection and transmission.

2(b) Answer the following question (any one). (4)

- (1) Write a short note on sinusoidal wave.
- (2) Explain polarization.

2(c) Answer the following question (any three). (3)

- (1) What is wave?
- (2) Define intensity.
- (3) is the distance by which maxima is "delayed".
- (4) Traveling speed of electromagnetic waves in empty space is, v =m/s.
- (5) The real amplitudes of electromagnetic waves are related by equation, $\mathbf{B}_0$ =

3(a) Answer the following question (any one). (7)

- (1) Write a note on retarded potentials.
- (2) Write a note on Lienard-Wiechert potentials.

3(b) Answer the following question (any one). (4)

- (1) Explain Coulomb gauge.
- (2) Explain Lorentz gauge.

3(c) Answer the following question (any three). (3)

- (1) $\nabla \times \mathbf{B} = \dots\dots\dots$
- (2) In Lorentz gauge $\nabla \cdot \mathbf{A} = \dots\dots\dots$
- (3) $\nabla^2 - \mu_0 \epsilon_0 \frac{\partial^2}{\partial t^2} \equiv \dots\dots\dots$
- (4) The curl of gradient of any scalar function is
- (5) Write equation of advanced time.

4(a) Answer the following question (any one). (7)

- (1) Derive the mathematical expression of the total power radiated by an oscillating electric dipole.
- (2) Explain the Lienard's generalization of Larmor formula.

4(b) Answer the following question (any one).

(4)

- (1) Explain the reason behind the blueness of the sky and redness of the sunset.
- (2) Derive the Abraham-Lorentz formula by explaining the radiation reaction.

4(c) Answer the following question (any three).

(3)

- (1) Whenaccelerate, their fields can transport energy irreversibly out to infinity.
- (2) When a high speed electron hits a metal target it rapidly decelerates, giving off what is called.....
- (3) An electric dipole consists of two like charges. True/False
- (4) $P_{\text{electric}} / P_{\text{magnetic}} = ?$
- (5) In the case of point charge, the radiated power.....as the particle velocity increases.

5(a) Answer the following question (any one).

(7)

- (1) Write a note on Galilean Lorentz transformations.
- (2) Write a note on relativistic dynamics.

5(b) Answer the following question (any one).

(4)

- (1) Explain time dilation.
- (2) Obtain expression for Einstein's velocity addition rule.

5(c) Answer the following question (any three).

(3)

- (1) Write the equation of time dilation.
- (2) Moving clocks run
- (3) Moving objects are
- (4) Write an equation for relativistic energy.
- (5) Which dimension of an object does not contract?
