

Roll No.....

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Code No. : B02/301

Second Semester Online Examination, May-June, 2022

M. Sc. PHYSICS

Paper III

ELECTRODYNAMICS

Time : Three Hours]

[Maximum Marks : 80

Note : Part A and B of each question in each unit consist of 'very short answer type question' which are to be answered in one or two sentences. Part C 'Short answer type' and D 'Long answer type' of each question should be answered within the word limit mentioned.

UNIT-I

1. (A) Explain D'Alembertian operator. 2
- (B) Write expression for retarded potential. 2
- (C) Prove that $\vec{E} \cdot \vec{B}$ is invariant under Lorentz transformation.

(word limit 200-250) 4

OR

What is scalar potential and vector potential.

P.T.O.

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- (D) Deduce expression of Lorentz transformation of space and time in four vector form. (word limit 400-450) 12

OR

Write Maxwell's equation in four vector form. Show that they are invariant under Lorentz transformation.

UNIT-II

2. (A) What is Cherenkov radiation? 2
- (B) What is difference between Bremsstrahlung radiation and synchrotron radiation? 2
- (C) Derive Abraham-Lorentz formula.

(word limit 200-250) 4

OR

Explain radiation damping.

- (D) Derive an expression for the radiated energy from an accelerated charged particle at low velocity. (word limit 400-450) 12

OR

Obtain the expression for angular distribution of radiation emitted by an accelerated charge particle.

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UNIT-III

3. (A) Write wave equations governing electromagnetic fields \vec{E} and \vec{H} in free space. 2
- (B) What do you mean by TM mode ? 2
- (C) Explain Fresnel formulae.

(word limit 200-250) 4

OR

Explain cavity resonator. What lowest modes are possible in TE mode of rectangular cavity resonator ?

- (D) What is wave guide ? For transverse electric waves perfectly propagating in rectangular wave guide with perfectly conducting wall, find cut of frequency and the velocity with which energy is transmitted along the guide.

(word limit 400-450) 12

OR

Discuss the propagation of electromagnetic waves in an isotropic dielectric medium.

[3]

P.T.O.

Show that waves are of transverse nature and wave energy is equally shared between electric and magnetic fields.

UNIT-IV

4. (A) What is lagrangian ? 2
- (B) Write expression for lagrangian in presence of magnetic field. 2
- (C) Show that momentum of charged particle in an electromagnetic field is given by $\vec{P} = m\vec{v} + q\vec{A}$ (word limit 200-250) 4

OR

Explain Lagrangian for free relativistic particle.

- (D) Explain energy-momentum tensor and derive conservation laws.

(word limit 400-450) 12

OR

Derive lagrangian for a charged particle in electromagnetic field

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