Roll No. ……

M.Sc. INTEGRATED
C. B. S. (6th SEM)
Pt. RAVISHANKAR SHUKLA UNIVERSITY, RAIPUR
MID TERM EXAMINATION, 2021
(Electrodynamics)
(P-601)

Time: Three Hours **Maximum Marks: 40**
Note: Attempt all Sections as directed.

Section -A
(Objective / Multiple Choice Questions)

Note: Choose the correct answer from the options given. **1 mark each**

1. An accelerated charge will produce
   a) electric, magnetic, and radiation fields
   b) electric and magnetic fields
   c) only magnetic field
   d) only electric field

2. The value of α for which the vector potential given as $\dot{A} = 2x\hat{i} + \alpha y\hat{j} + z\hat{k}$ will follow the coulomb gauge.
   a) 3
   b) -3
   c) 1
   d) None of the above

3. Which of the following is the expression for Lorentz force?
   a) qE
   b) q (v x B)
   c) ma + qE
   d) qE + q (v x B)

4. Which of the following laws do not form a Maxwell equation?
   a) Planck's law
   b) Gauss's Law
   c) Faraday's law
   d) Ampere's Law

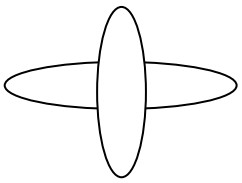
5. While driving in winter, through dense fog, one can see rays from headlights emitted

by vehicle reaching towards us is due to...

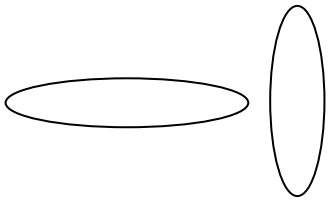
a) Scattering of light
b) Atmospheric refraction
c) Reflection of light
d) Dispersion of light

6. In which of the following cases is the mutual induction between the two wire loops zero?

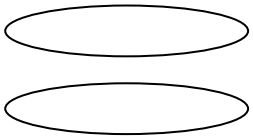
a)



b)



c)



d)

7. Which of the following formulas is correct? (multiple answers may be true)

a) J=nevd
b) $v_d=\frac{\sigma E}{ne}$
c) $m_{21} \neq m_{12}$(in some cases it may be equal but in general it isn't.)
d) $\nabla \times B = \Pi_0 J$

8. For electromagnetic radiation E~ and B~ fields

a) both varies as r −1
b) both varies as r −2
c) E field varies as r −1 but B field varies as r −2
d) E field varies as r −2 but B field varies as r −1

9. The magnetic field associated with the electric field vector $E=E_0\sin(kz-wt)\hat{j}$ is given by

a) $B= -\frac{E0}{c}\sin(kz-wt)\hat{\imath}$

b) B= $\frac{E0}{c}$sin(kz-wt)$\hat{\imath}$

c) B= $\frac{E0}{c}$sin(kz-wt)$\hat{\jmath}$

d) B= $\frac{E0}{c}$sin(kz-wt)$\check{k}$

10. Which one of the following is most essential for observing diffraction of light
(a) monochromatic light
(b) white light
(c) a very narrow slit or obstacle
(d) two coherent sources

Section –B

3 mark each

1. Write the expressions for Lorentz ad Coulombs gauges. Hence explain the two conditions.

2. For plane electromagnetic waves propagating in k direction we have that
$B = \frac{K \times E}{\omega}$ show that $E = \frac{-\omega}{k2}(k \times B)$

3. Discuss the physical significance of all Maxwell's equations.

4. Discuss Magnetic dipole radiation.

5. The electric field component of a plane electromagnetic wave travelling in vaccum is given by vector $E(z,t) = E_0 \cos(kz - wt)\hat{\imath}$. Calculate the poynting vector for this wave.

Section- C

Note: Attempt any three questions.

5 marks each

1. Explain the term Multipole moments. Derive an expression for potential at a distant point using multipole expansion for a localized charge distribution in free space.

2. Explain the Retarted potential and derive the retarted vector and scalar potential.

3. A circular ring in the xy plane (radius R, centered at the origin) carries a uniform line charge λ. Find the first three terms (n=0,1,2) in the multipole expansion for V(r,θ).

4. Obtain an expression of electric field of a moving point charge. Discuss electric dipole radiation.

5. Obtain an expression of electric and magnetic field using Jefimenko's equations.