KATWA COLLEGE
DEPARTMENTOFPHYSICS

INTERNALASSESSMENTEXAMINATION-2022

SEMESTER-II : PAPER: CC- III Time:1 hour

SUBJECT: ELECTRICITY &MAGNETISM F.M:10marks

Answer any five of the following questions taking at least two from each group:-

Group-A

1. Find the electric field inside and outside of a sphere of radius R, charge Q and charge density which varies as r^n, $(n > -3)$.
2. Calculatethework donein carrying thepositivecharge Qin acircular pathof radiusr arounda infinite line charge withline charge density λ.Alsocalculatetheworkdoneincarryingthepositivechargefrom radius a to b along radial direction in the same case.
3. Two infinitely long line charges parallel to the z axis pass through the point A(0, b, 0) and B(0, -b, 0). Calculate the resultant electric field intensity at the point (a, 0, 0) on the x axis.
4. Inaonedimensionaldevicethechargedensityis$\rho=\rho_o($ $\frac{x}{x_o}$ $)$.If electricfieldintensity$\vec{E}=0$at$x=0$andelectricpotential$V=0$ at$x=x_1$,findpotentialasafunction$x$;$V(x)$.

Group-B

5. Provethatmagneticforceonaclosedcurrentloopplacedin auniform magnetic field is always zero.
6. A current element$i\vec{d}\rightarrow l$ is directed along z-axis and is located at the origin. What is the x-component of the magnetic field at the point (1,1,1) ?
7. A particle of charge$q$ is projected with a speed $\vec{v}$along$x$ axis in a regionofspacehavingamagneticfield$\vec{B}=Aj\hat{+}C\,\hat{k}$,where$AandC$ are constants. Find the force on the particle.
8. Certain volume current density $J\rightarrow$gives rise to the magnetic vector potential$\vec{A}(r,\theta,z)=k\,\hat{\theta}$;$k$issomeconstant.Findthecorresponding magneticfield$\vec{B}$. (Hints:Treattheproblemincylindricalcoordinate (r,θ,z); $\hat{\theta}$is the unit vector).