PHL 111

Course: Electrodynamics
Minor-2

Total marks=20 Time=1 hour

Answer all the questions:

1. Evaluate the following integrals

(a) $\int_{-\infty}^{\infty} \ln(x+3)\delta(x+2)dx$

(b) $\int_{0}^{5} \cos x\,\delta(x-\pi)dx$

(c) $\int_{0}^{3} x^3\delta(x+1)dx$

(d) $\int_{-\infty}^{\infty} \ln(x+3)\delta(x+2)dx$

(e) $\int_{-\infty}^{a} \delta(x-b)dx$

5x1=5

2. If $\vec{B}$ is uniform, show that $\vec{A}(r)=\frac{1}{2}\vec{r}\times\vec{B}$. What current density would produce the vector potential $\vec{A}(r)=k\hat{\phi}$.

3+2=5

3. Show that $\vec{E}(\vec{r},t)=-\frac{1}{4\pi\varepsilon_0}\frac{q}{r^2}\theta(vt-r)\hat{r};\vec{B}(\vec{r},t)=0$ satisfy Maxwell's equation and determine ρ and $\vec{J}$; where $\theta(x)=\begin{cases}1, & x>0\\ 0, & x\le 0\end{cases}$.

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4. Find the fields and the charge and current distribution corresponding to $V(\vec{r},t)=0;A(\vec{r},t)=-\frac{1}{4\pi\varepsilon_0}\frac{qt}{r^2}\hat{r}$. Use the gauge function $\lambda=-\frac{1}{4\pi\varepsilon_0}\frac{qt}{r}$ to transform the potentials and comment on the results. Find the Liénard-wiechert potential of a point charge moving with constant velocity.

2+3=5