Radiation Intensity, U

Area 1)

$$U = \frac{d\Pi_{rad}}{d\Omega} \quad W/Sr$$

A useful expression,

$$\Pi_{rad} = \iint U \, d\Omega \, , W$$

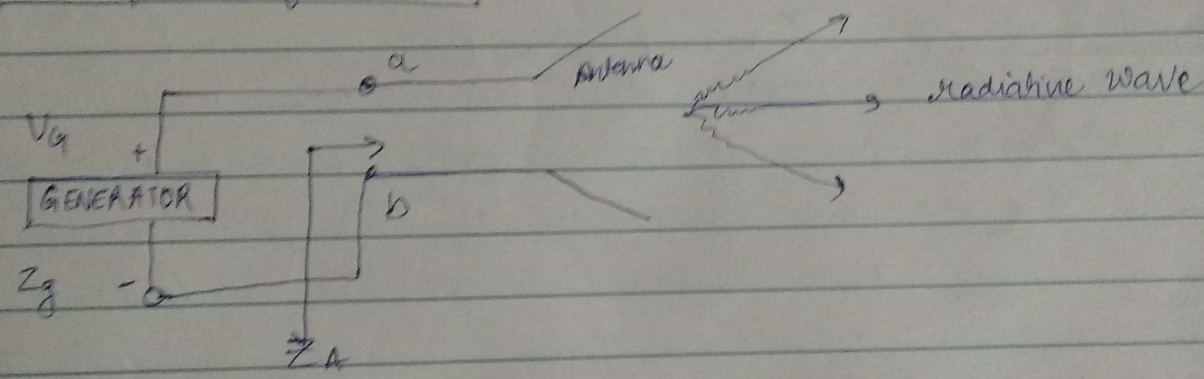
So,

$$P = \frac{d\Gamma}{dS} \, , W/m^2$$

then

$$U = r^2 P$$

Input impedance of Antenna



Using thevenin,

$Z_g = R_g + jX_g$ $\quad V_g \rightarrow$ peak generator voltage

$Z_A = R_A + jX_A$

R_A $\quad R_L$

Directivity

directivity of an antenna is the ratio of the maximum power density $P(\theta, \phi)_{max}$ to it's average value over a sphere as considered

$$D = \frac{P(\theta, \phi)_{max}}{P(\theta, \phi)_{av}}$$

$$P(\theta, \phi)_{av} = \frac{1}{4\pi} \int_{\phi=0}^{\phi=2\pi} \int_{\theta=0}^{\pi} P(\theta, \phi) \sin\theta \, d\phi \, d\theta$$

$$P(\theta, \phi)_{av} = \frac{1}{4\pi} \iint_{4\pi} P(\theta, \phi) \, d\Omega$$

So directivity is

$$D = \frac{P(\theta, \phi)_{max}}{\frac{1}{4\pi} \iint_{4\pi} P(\theta, \phi) \, d\Omega} = \frac{1}{\left(\frac{1}{4\pi}\right) \iint_{A} \left[P(\theta, \phi) / P(\theta, \phi)_{max}\right]}$$

$$D = \frac{4\pi}{\iint_{4\pi} P_a(\theta, \phi) \, d\Omega} = \frac{4\pi (sr)}{\Omega_A (sr)}$$

Ans c) Beam width is the aperture angle from where most of power is radiated the two main considerations of this beam width are HPBW and FNBW.
The gain G of an antenna is the ratio of radiation intensity U in a given direction and the radiation intensity that would be obtained, if the power fed to the antenna were radiated isotropically

Ans 3)

The radiation resistance relates the radiated power to the voltage (or current) at the antenna terminals.

$$R_R = \frac{2P}{|I|^2}, \Omega$$

Ans 4)

Linear Polarization – occurs when either when there is only one component of the electric field or when there are two components of the electric field and the phase difference between them is 0° or 180°

Circular Polarization – occurs when there are two components of the electric field, and may are equal in magnitude and one of the components leads the other by 90°

Elliptical Polarization – occurs when the component of the electric field do not have magnitude and have an arbitrary phase difference between them, the electric field vector traces out an ellipse with time.