$= 40\pi^2 \left(\frac{100\times100}{16\times16}\right) = 1.54056\times 10^4$watts

= **15.4056kW**

$R_r = 80\pi^2 \times \left(\frac{dl}{\lambda}\right)^2$

$= 80\pi^2 \times \left(\frac{\lambda}{16\times\lambda}\right)^2$

$= \frac{80\times(3.14)^2}{256} = \frac{788\times768}{256}$

= 3.0812 ohms

TWO MARK QUESTIONS

1. Define an antenna .

Antenna is a transition device or a transducer between a guided wave and a free space wave or vice versa. Antenna is also said to be an impedance transforming device.

2 Define Hertzian dipole (oscillating dipole.)

A Hertizan dipole is an elementary sources consisting of a time – harmonic electric current element of a specified direction and infinitesimal length.

3. Define Radiation field.

The radiation field will be produced at a larger distance from the current element, where the distance from the centre of the dipole to the particular point is very large i, e., r >>λ .It is also called as distant field or far field.

4. Define Radiation Resistance.

It is defined as the fictitious resistance which when inserted in series with the antenna will consume the same amount of power as it is actually radiated. The antenna appears to the transmission line as a resistive component and this is known as the radiation resistance.

5. State pointing theorem.

It states that the vector product of electric field intensity vector E and the magnetic field intensity vector H at any point is a measure of the rate energy flow per unit area at the point i,e.,P=E $\times H.The$ direction of power flow is perpendicular to both the electric field and magnetic field components.

6. What is a short dipole?

A short dipole is one in which the field is oscillating because of the oscillating voltage and current .It is called so , because the length of the dipole is short and the current is almost constant throughout the entire length of the dipole. It is also called as Hertzian Dipole which is a hypothetical antenna and is defined as short isolated conductor carrying alternating current.

7. How radiations are created from a short dipole?

The dipole has two equal charges of opposite sign oscillating up and down in a harmonic motion. The charges will move towards each other and electric field lines were created. When the charges meet the midpoint, the field lines cut each other and new field are created This process is spontaneous and so more fields are created around the antenna. This is how radiations are obtained from a short dipole.

8. Why a short dipole is also called an elemental dipole?

A short dipole that does have a uniform current will be known as the elemental dipole. Such a dipole will generally be shorter than the one tenth of a wave length. Elemental dipole is also called as elementary dipole, elementary doublet and Hertzian dipole.

9.what is Infinitesimal Dipole?

When the length of the short dipole is vanishingly small, then such a dipole is called a infinitesimal dipole. If dl be the infinitesimally small length and I be the current, the Idl is called as the current element.

10.Why a short dipole is called an oscillation dipole

A short dipole is initially in neutral condition and the moment a current starts to flow in one direction, one half of the dipole require an excess of charge and the other a deficit because a current is flow of electrical charge. Then, there will be a voltage between the two halves of the dipole .When the current changes its direction this charge unbalance will cause oscillations. Hence an oscillating current will result in an oscillating voltage. Since, in such dipole, electric charge oscillates, it may be called as oscillating electric dipole.

11. what are the field zone?

The fields around an antenna may be divided into two principal regions.

(i) Near field zone (Fresnel zone)

(ii) Far field zone (Fraunhofer zone)

12. what is meant by isotropic radiator?

An isotropic radiator is a fictitious radiator and is defined as a radiator which radiates fields uniformly in all directions. It is also called as isotropic source or omni-directional radiator or simply unipole.

13. What is meant by radiation pattern?

Radiation pattern is the relative distribution of radiated power as a function of distance in space. It is a graph which shows the variation in actual field strength of the EM wave at all points which are at equal distance from the antenna. The energy radiated in a particular direction by an antenna is measured in terms of FIELD STRENGTH.(E Volts/m).

14. Define Radiation intensity.

The power radiated from an antenna per unit solid angle is called the radiation intensity (watts per steradian or per square degree).

The radiation intensity is independent of distance.

15.Define Beam efficiency.

The total beam area (WA) consists of the main beam area(WM) plus the minor lobe area(Wm).Thus

WA =WM + Wm

The ratio of the main beam area to the total beam area is called beam efficiency.

Beam =SW $=\frac{WM}{WA}$

16. Define Directivity.

The directivity of an antenna is equal to the ratio of the maximum power density $p(q,f)_{max}$ to its average value over a sphere as observed as observed in the far field of an antenna.

$D = \frac{P(q,f)_{max}}{P(q,f)Av}$ Directivity from pattern

$D = \frac{4p}{WA}$

Directivity from beam area (WA).

17.What are the different types of aperture?

(i) Effective aperture
(ii) Scattering aperture
(iii) Loss aperture
(iv) Collecting aperture
(v) Physical aperture

18.Define different types of aperture.

Effective aperture (A_e) : It is the area over which the power is extracted from the incident wave and delivered to the load is called effective aperture.

Scattering aperture (A_s) : It is the ratio of the reradiated power to the power density of the incident wave.

Loss aperture (A_l) : It is the area of the antenna which dissipates power as heat.

Collecting aperture (A_c) : It is the addition of above three apertures.

Physical aperture (A_p) : This aperture is a measure of the physical size of the antenna.

19.Define Aperture efficiency.

The ratio of the effective aperture to the physical aperture is the aperture efficiency.

i,e Aperture efficiency (dimensionless) = $h_{ap} = \frac{A_e}{A_p}$

20. What is meant by effective height (length)?

The effective h of an antenna is the parameter related to the aperture. It may be defined as the ratio of the induced voltage to the incident field.

i.e., $H = \frac{V}{E}$

21. Define gain.

The ratio of maximum radiation in given direction to the maximum radiation intensity from a reference antenna produced in the same direction with same input power, i. e.,

$$\text{Gain(G)} = \frac{\text{Maximum radiation intensity from test antenna}}{\text{Maximum radiation intensity from the referency antenna with same input power}}$$

22.Define self impedance.

Self impedance of an antenna is defined as its input impedance with all other antennas are completely removed i.e. away from it.

23. Define mutual impedance.

The presence of nearby antenna No.2 induces a current in the antennas no.1 indicates that presence of antenna no.2 changes the impedance of the antenna no.1.This effect is called mutual coupling and results in mutual impedance.

24.What is meant by cross field ?

Normally the electric field E is perpendicular to the direction of wave propagation. In some situation the electric field E is parallel to the wave propagation. This condition is called cross field

25.Define axial ratio.

The ratio of the major to the minor axes of the polarization ellipse is called the Axial Ratio (AR).

26.What is meant by polarization?

The polarization of the radio wave can be defined by direction in which the electric vector E is aligned during the passage of atleast one full cycle. Also polarization can also be defined as the physical orientation of the radiated electromagnetic waves in space. The polarizations are three types. They are Elliptical polarization, circular polarization and linear polarization.

27. What is meant by front to back ratio?

It is defined as the ratio of the power radiated in desired direction to the power radiated in the opposite direction i.e.,

$$\text{FBR} = \frac{Power\ radiated\ \ in\ desireddirection}{Power\ \ radi\,ated\ \ in\ the\ opposite\ \ direction}$$

28. Define antenna efficiency.

The efficiency of an antenna is defined as the ratio of power radiated to the total input power supplied to the antenna.

$$\text{Antenna efficiency} = \frac{Power\ \ radiated}{Total\ \ input\ \ power}$$