

- N.B.** (1) Question No. 1 is **compulsory**.
 (2) Attempt any **four** questions out of remainign **six** questions.
 (3) Assume any **suitable** data whenever **required**.
 (4) **Figures** to the **right** indicate **full** marks.

1. Explain the following :—
- Directivity, gain, radiation resistance and beam width. 4
 - Compare Travelling wave and Standing wave antennas. 4
 - Compare Rhombic and Loop antennas. 4
 - FRIIS transmission formula. 4
 - Maxwell's equation in time varying integral and differential form. 4

2. (a) Derive the formula for instantaneous power density using Poynting theorem. 10
 (b) Electric fluid intensity of an electromagnetic wave in free space is given by :— 10

$$E_x = 0, E_z = 0, E_y = E_0 \cos w \left(t - \frac{z}{v} \right).$$

Determine the expression for components for magnetic fluid intensity using, Maxwell's equation in free space.

3. (a) Show that radiation resistance of a wire dipole is given by :— 10

$$R_{\text{rad}} = 80 \pi^2 \left(\frac{dl}{\lambda} \right)^2 \text{ where } dl \text{ is the small length of wire dipole.}$$

- (b) A Transmitting antenna has an effective height $\frac{2}{\pi}$ times of its physical length. This carries 10

a current of 1600 Amp at the base and operates at frequency 20 KHz. If the physical length of antenna is 200 m. and antenna efficiency is 10% .

Calculate :

- Electric fluid intensity at 350 km
- Radiation resistance
- Power radiated
- Power input in antenna
- Voltage induced in receiving antenna of 100 m effective heights at the distance 350 km.

4. (a) Why antenna array is required ? Explain broadside and end fire array in detail. 10
 (b) Obtain the radiation pattern for 8 isotropic antennas of equal magnitude and spaced by $\lambda/2$ for end fire array. 10

5. (a) Explain the construction and properties of Yagi-Uda antenna. Also sketch its radiation pattern. 10
 (b) Explain different types of horn antenna. Find its directivity and beam width. 10

6. (a) A 64 meter diameter paraboloid reflector is fed by a non-directional antenna at 1430 MHz. 10
 Calculate beam width between half power points and nulls. Also calculate power gain with respect to half wave dipole.

- (b) Explain transmission line model of rectangular patch microstrip antenna. Also give its applications. 10

7. Explain the following :— 20

- Sky wave propagation
- Pattern multiplication
- Sleve dipole
- Ground interference effect.