

Q.1

- a) Explain how ground and sky wave interference can occur. What are the different regions associated with this situation?
- b) What does the term "Required protection ratio is 200:1" mean? Explain by an example.
- c) What does the terms MUF and OWF stand for?

Q.2

- a) What is the probable range of good reception from a 900 kHz radio broadcasting transmitter with $E_1=1200$ mV/m over surrounding land with mean conductivity = 10 mS/m? Assume that the minimum level of signal for good reception is 1 mV/m.
- b) A satellite to earth communication link at $F=4$ GHz uses 1m and 4m diameter paraboloidal reflector antennas respectively, with illumination efficiency of 0.5 for each. If the satellite antenna transmit 3W and the distance is 36000 KM find the available power at the matched receiver. What is the electric field intensity at the receiving antenna?

Q.3

- a) One vertical monopole is 100m high. It is supplied with 100 A (rms) base current. Find the radiated power and the unattenuated field at 1km. a) $f=300$ kHz b) $f= 1$ MHz .
- b) What are the magnitudes of the maximum usable frequency MUF and the optimum Working Frequency OWF associated with an HF radio link extending over 2500 Km via reflection from the F2 layer for the summer and winter seasons at noon time and for the maximum and minimum sunspots. Estimate the path loss at height of 300Km, assuming $R12=100$ $F_H=1.25$ MHz, latitude=50 and $x=65^\circ$.

Q.4

- a) What is the basic idea of the monopulse radar.
- b) If you have a radar transmitter of peak power of 300KW, the pulse repetition frequency is 500Hz, the transmitter BW=1MHz what is the average power output from the transmitter, What is the unambiguous range.
- c) A radar system operating at 3GHz with $G_t=G_r=13\text{dB}$. The maximum detection range is 150Km. Find the minimum detectable target cross-section if the minimum detectable signal strength is 1pw.

Q.5

- a) What should be the distance d between two element broadside array in order to get a null at 20° from broadside.
- b) Explain how a radar system can be used to detect moving targets over a large clutter.
- c) Explain the effect of pulse integration in a pulse radar system. What is the difference between coherent and non coherent integration.