JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST-3 EXAMINATIONS-DEC-2023
PhD 1st Semester

COURSE CODE (CREDITS): 13M1WEC334 (3)

MAX. MARKS: 35

COURSE NAME: Antenna Theory and Techniques

COURSE INSTRUCTOR: Dr. Naveen Jaglan

MAX. TIME: 2 Hr.

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

1. Derive the expressions for the near and far field components of Hertz dipole. Calculate the radiation resistance and total power radiated by this antenna. [CO-1,2; 4 Marks]

2. Calculate BWFN, HPBW, direction of pattern minima, direction of nulls and phase difference b/w sources for a 4-element broadside antenna array with equal amplitude and spacing. [CO-1,4; 4 Marks]

3. Find the direction of nulls and thereafter plot the radiation patterns of $\frac{\lambda}{2}$, λ, $\frac{3\lambda}{2}$, 2λ length dipole antennas. [CO-3,4; 4 Marks]

4. Derive and explain antenna reciprocity theorem. What are the limitations of this theorem? [CO-1,2; 3 Marks]

5. A small dipole of length 0.1λ is excited with a peak current of 5 Amperes. How much power will be radiated by the antenna? [CO-3,4; 3 Marks]

6. Explain the concept of Binomial antenna array. What are the advantages of Dolph-Tchebyscheff antenna array over Binomial antenna array? [CO-4,5; 4 Marks]

7. Explain the concept of frequency independent antennas. Describe the working principle of log-periodic antenna considering transmission region, active region and reflective region. [CO-4,5; 4 Marks]

8. Determine Dolph-Tchebyscheff current distribution for the maximum beam width of a linear in phase broadside array of eight isotropic sources. The spacing b/w the elements are $\frac{3\lambda}{4}$ and the side lobe level is 40 dB down. What is the half power beam width?

[CO-3,4; 3 Marks]

9. Explain the concept of frequency independent antennas. Describe the working principle of log-periodic antenna considering transmission region, active region and reflective region.

[CO- 4,5; 3 Marks]

10. What is the maximum power received at a distance of 0.5 km over a free space 1 GHz circuit consisting of a transmitting antenna with a 25 dB gain and a receiving antenna with a 20 dB gain? The gain is with respect to lossless isotropic source. The transmitting antenna input is 150W.

[CO-3,4; 3 Marks]