Dr. Naveen Jaglan

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- May 2019

B.Tech 8th Semester

COURSE CODE:13B1WEC832 MAX. MARKS: 35

COURSE NAME: Modern Antennas

COURSE CREDITS: 3 MAX. TIME: 2Hrs

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

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1. Design a Linear array with spacing between elements of $d = \frac{\lambda}{4}$ such that it has zeros $\theta = 0^{\circ}$, $\theta = 90^{\circ}$ and $\theta = 180^{\circ}$ .Determine the number of elements, their excitation and plot the desired radiation pattern. [CO-2,3; 5 Marks]
2. 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-4, 5; 5 Marks]
3. Derive the expressions for near and far field components of Hertz dipole? Calculate the radiation resistance, total power radiated and directivity of this antenna.

   [CO-1, 2; 5 Marks]
4. 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-1,2; 5 Marks]
5. Explain normal mode and axial mode of radiations for helical antennas?

   [CO-3, 5; 4 Marks]
6. What are the advantages of different feeding techniques available in microwave dish antennas? [CO-4,5; 3 Marks]
7. What are the advantages of Dolph-Tchebyscheff antenna array over Binomial array?

   [CO-4, 5; 3 Marks]

8. An antenna is fed with a 100 W power. The efficiency of the antenna is 80%. If the radiation pattern of the antenna is:

$$P(\theta) = \sin^2\theta \sin^2\phi \quad 0 \le \theta \le \pi$$
$$0 \le \phi \le \pi$$

and zero elsewhere, Find the radiation intensity in the direction of maximum radiation. Also, find the power density at a distance of 10 Km in the direction of Maximum radiation. [CO-3, 5; 5 Marks]