VIT UNIVERSITY
(Estd. u/s 3 of UGC Act 1956)

School of Electronics Engineering
CAT-II Winter 2019-2020
ECE 3010 Antennas and Wave Propagation

Course : B.Tech (ECE)
Faculty Name : K.Shambavi
Date of Exam : 02.03.2020

Max Marks: 50
Time: 1 ½ hrs
Slot : B1

Q.No	*Answer all the questions*	Marks
1.	The radiation intensity of an antenna is $U(\theta) = \sin^2(2\theta)$, $0 \le \theta \le \pi$, $0 \le \varphi \le 2\pi$ Determine (i) Beam area (ii) Directivity (iii) Maximum effective area of the antenna	(10)
2.a	A thin dipole antenna is $\lambda/15$ long. If its loss resistance is 1.5 Ω, find radiation resistance and efficiency.	(4)
b.	The normalized E-field pattern of an antenna varies as $0.5(1 + \cos\theta)$, where, angle θ is measured from broadside direction. Find (i) Half power beamwidth (ii) Beamwidth between first null.	(6)
3. a	Two identical transmitting and receiving antennas are located at a distance of 2km. Power transmitted is 30dBm at 15GHz and received power is -70dBm. Determine the gain of each antenna.	(5)
b.	Marine radar operating at 10 GHz has a maximum range of 50 km with an antenna gain of 36 dB. If the transmitter has a power of 250 kW and minimum detectable signal of 10^{-11} W, determine the cross section of the target the radar can sight.	(5)
4.	A uniform linear array consists of 8 isotropic point sources with $\lambda/8$ spacing and phase difference of -45°. Determine i. Array length ii. Angle of major lobe, minor lobes and Null iii. BWFN , HPBW. Sketch the radiation pattern of the array that depicts the above determined value.	(10)
5. a	Four isotropic sources are placed $\lambda/6$ m apart. They have a phase difference of 60° between the adjacent elements. Find the beamwidth between first nulls.	(4)
b.	Design a binomial array of seven elements placed along the z-axis separated by a distance $d = \lambda/2$. (a) Find the amplitude excitation coefficients (b) Half Power beam width and directivity. (d) Draw the Radiation pattern.	(6)

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