



VIT

Vellore Institute of Technology

(Chartered into University under section 3 of the UCA Act, 1956)

School of Electronics Engineering
B. Tech (ECE) - CAT-I Examination – Winter 2023-24
Antenna and Microwave Engineering (BECE305L)

Time: 90 Min.

Slot – B1

Marks : 50

S. No.	Answer all questions	Marks
1a.	An antenna has a field pattern given by $P(\theta) = \cos^2 \theta$ for $0^\circ \leq \theta \leq 90^\circ$. Find the half power beamwidth, beamwidth between first nulls and beam area.	10
1b.	An antenna has a radiation resistance of 73Ω , a loss resistance of 12Ω and a power gain of 15 dB. Determine the antenna efficiency.	
2.	The normalized radiation intensity of an antenna is represented by $U(\theta, \phi) = \cos^4 \theta \sin^2 \phi$ W/Sr, ($0 \leq \theta \leq \pi/2$; $0 \leq \phi \leq 2\pi$). Find the directivity (in dB).	10
3.	A 100 W, 10 GHz signal was transmitted toward the target, and the received power was measured to be 10^{-16} W. Antenna with gain of 80 (dimensionless), is used for both transmitting and receiving signal. The polarizations of both signals were matched and the distance between the antenna and target structure was 10^4 m. What is the radar cross section of the target structure?	5
4.	A 1m long dipole antenna is driven by a 150 MHz source with a source resistance of 50Ω and a voltage of 100 V. If the ohmic resistance of the antenna is given by $R_L = 0.625 \Omega$, determine a) the equivalent circuit b) current going in to the antenna c) average power dissipated by the antenna d) average power radiated by the antenna.	10
5.	A four element broadside array consists of isotropic radiators with spacing between consecutive elements is 0.5λ . Find the array factor, minor lobe maxima, half power beamwidth, first null beamwidth and plot radiation pattern.	10
6.	Design an ordinary uniform end-fire uniform linear array with only one maximum so that its directivity is 20 dB. It consists of spacing $d = \lambda/4$ and its length is much greater than spacing. Determine number of elements and overall length of the array.	5