

M.E. (ETCE) 1st YEAR EXAMINATION, 2017
(1st Semester)

ANTENNA ANALYSIS AND SYNTHESIS

Time: Three hours

Full Marks 100

No. of questions		Marks
	<i>Answer question no. 1 and any four from the rest.</i>	
1.	In each case, choose the correct/best alternative.	
(i)	At very large distances from the source, a spherical wave may be treated (a) as a plane wave (b) as a cylindrical wave (c) either as a plane wave or as a cylindrical wave (d) neither as a plane wave nor as a cylindrical wave	
(ii)	Left circularly polarized radiation can be received by (a) a vertically polarized antenna (b) a horizontally polarized antenna (c) a left circularly polarized antenna (d) all of the above	
(iii)	A current sheet may exist (a) on a dielectric-dielectric interface (b) on a dielectric-conductor interface (c) on a conductor-conductor interface (d) on no cases cited above	
(iv)	As frequency increases, displacement current (a) increases (b) decreases (c) remains constant (d) changes unpredictably	
(v)	On a short dipole, the current distribution may be assumed to be (a) sinusoidal (b) constant (c) triangular (d) parabolic	
(vi)	An array with no sidelobes is (a) Chebyshev array (b) Taylor array (c) Binomial array (d) None of the above	2X6
2.(a)	Discuss the inconsistency of Ampere's law and how it was removed by Maxwell.	8
(b)	Write the resulting Maxwell Heaviside equations both in integral and differential forms.	8
(c)	Derive the wave equations for both electric and magnetic fields therefrom.	6

3.(a)	In unbounded free space, show that electromagnetic fields are essentially of wave nature.	10
(b)	Hence prove that the mode of propagation there is TEM.	12
4 (a)	In context of antennas, define Radiation Pattern, Gain, Directivity and Effective Aperture.	8
(b)	Elaborate how the problem of radiation from a time varying current source is solved.	10
(c)	Explain why no other gauge condition except Lorentz gauge condition is accepted in this process.	4
5.(a)	Define polarization.	2
(b)	Establish that elliptical is the most general form of polarization.	10
(c)	State and prove Poynting theorem.	6
(d)	Logically establish that only field components varying inversely with distance can contribute to outward power flow.	4
6.(a)	State the three theorems of Schelkunoff on linear arrays.	6
(b)	Show that for a uniform linear array, the side lobe level cannot be improved beyond a certain limit.	10
(c)	Which performance figure can be increased monotonically by increasing the length of a uniform linear array?	2
(d)	Justify your answer to the last question.	4
7.(a)	Explain principle of pattern multiplication in linear arrays with a suitable example.	6
(b)	Prove that the beam width for a uniform broadside array is less than that for a uniform endfire array.	8
(c)	Discuss the principle of duality in electromagnetics.	8