Sem V (EXTC) (CBSGS) RFMD Dec'17 30/11/17

QP CODE : 22617

(3 Hours) Marks : 80

N.B. : (1) Question **No. 1** is **compulsory.**
(2) Solve **any three** questions from the remaining **five.**
(3) Figures to the right indicate full marks
(4) Assume suitable data if necessary and mention the same in answer sheet.

Q.1 Attempt **any four** out of the remaining **five** [20]

a) Explain hazards of electromagnetic radiation.

b) Explain how Richard's transformation and unit elements are useful in RF filter designing.

c) Explain near field, inductive field and radiation field related to antenna.

d) Explain pattern multiplication for antenna array.

e) What are characteristics of Horn antenna ?

Q.2 a) Design a low pass composite filter with cut-off frequency 3 MHz and impedance of 75 Ω. Place infinite attenuation pole at 3.08 MHz. [10]
b) Explain with equivalent circuits the RF behaviour of resistor, capacitor and inductor. [10]

Q.3 a) Design a maximally flat low pass filter with a cut-off frequency of 2 GHz, impedance of 50 Ω, and at least 15 dB insertion loss at 3 GHz. [10]
b) Explain in detail dipole antenna. Compare dipole, monopole and folded dipole antennas. [10]

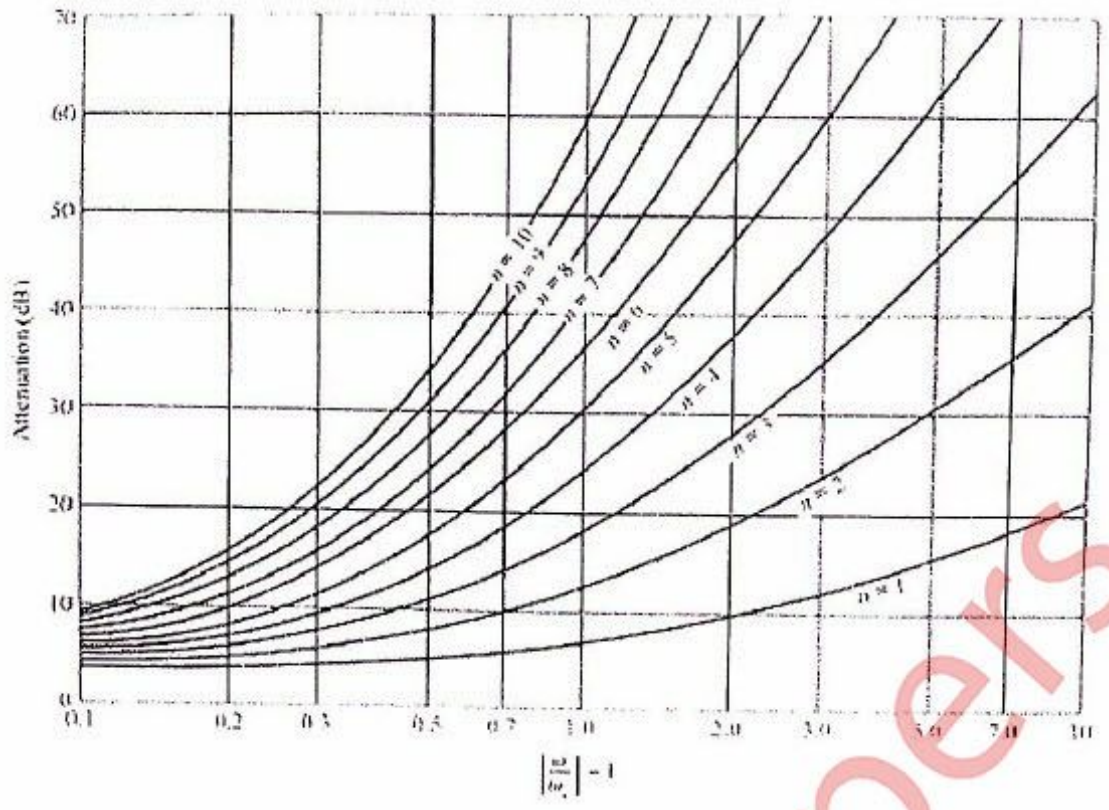
Q.4 a) Derive radiation resistance of infinitesimal dipole. [10]

b) Find the radiation pattern of an array of 2 isotropic point sources fed with same amplitude and opposite phase and spaced $\lambda/2$ apart. Find its HPBW and FNBW. [10]

Q.5 a) Explain working principle of Yagi-Uda antenna and draw its radiation pattern. Mention its applications. [10]
b) Draw the structure of microstrip antenna. Discuss its characteristics, limitations and applications. [10]

Q.6 Write short notes on the following : [20]

a) Friss transmission formula
b) Log periodic antenna
c) Helical antenna
d) Principle of parabolic reflector antenna



Attenuation versus normalized frequency for maximally flat filter prototypes

Adapted from G. L. Matthaei, L. Young, and E. M. T. Jones, *Microwave Filters, Impedance-Matching Networks, and Coupling Structures*, Artech House, Dedham, Mass., 1980, with permission.

Element Values for Maximally Flat Low-Pass Filter Prototypes ($g_0 = 1$, $\omega_c = 1$, $N = 1$ to 10)

N	g_1	g_2	g_3	g_4	g_5	g_6	g_7	g_8	g_9	g_{10}	g_{11}
1	2.0000	1.0000									
2	1.4142	1.4142	1.0000								
3	1.0000	2.0000	1.0000	1.0000							
4	0.7654	1.8478	1.8478	0.7654	1.0000						
5	0.6180	1.6180	2.0000	1.6180	0.6180	1.0000					
6	0.5176	1.4142	1.9318	1.9318	1.4142	0.5176	1.0000				
7	0.4450	1.2470	1.8019	2.0000	1.8019	1.2470	0.4450	1.0000			
8	0.3902	1.1111	1.6629	1.9615	1.9615	1.6629	1.1111	0.3902	1.0000		
9	0.3473	1.0000	1.5321	1.8794	2.0000	1.8794	1.5321	1.0000	0.3473	1.0000	
10	0.3129	0.9080	1.4142	1.7820	1.9754	1.9754	1.7820	1.4142	0.9080	0.3129	1.0000

Source: Reprinted from G. L. Matthaei, L. Young, and E. M. T. Jones, *Microwave Filters, Impedance-Matching Networks, and Coupling Structures*, Artech House, Dedham, Mass., 1980, with permission.