University of Technology
Department of Electrical Engineering
Final Examination 2012-2013

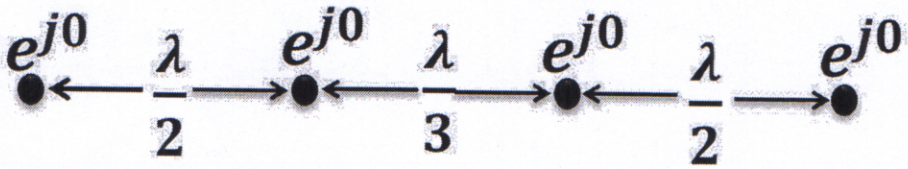
Subject: Antenna and wave propagation *Class: Undergraduate*
Division: Communication *Time: 3 Hours*
Examiner: Dr. Hussein B. Alwan *Date: 2013*

Attempt six questions

Q1. Derive from the first principle the radiation resistance for ideal dipole . **[10 marks]**

Q2. An antenna operating at 150MHZ has physical aperture area of $100m^2$ a gain of 23dB and directivity of 23.5dB . Compute A_e ,A_{em} ,ε_{ap} ,e . **[12 marks]**

Q3. Given the system of isotropic point source



Find the array factor. **[12 marks]**

Q4. The satellite down link communication system operates at 4 GHZ with EIRP(t) =30dBw and $\frac{G}{T}(R) = 40dB/K^{\circ}$ and bandwidth B=60MHZ and d=40000KM .What is the carrier to noise ratio CNR(R) at receiving station . $k=1.38\times10^{-23}$. **[12 marks]**

Q5. Show that (Free space losses) for RRL is given by :

$$A_{\circ} = 92.5 + 20\,log\big(r(KM)\big) + 20\,log\big(f(GHZ)\big)$$ **[12 marks]**

Q6. What is the probable range of good reception from 700KHZ radio broadcasting transmitter with E_1=1500mv/m, over surrounding land with σ=10ms/m . Assume that the minimum level of signal for good reception is 15mv/m in a city . **[12 marks]**

Q7. VHF radio communication system contains two stations operate at frequency 40MHZ at 10Km apart and P_T=1W. If the sensitivity of receiver is 3μv and antennas used are short dipole of length 1.5 m and height 10m for both T_x and R_x . Assume antenna efficiency is 0.25.

a)Check whether there is communication or not.

b)what is the maximum range for communication **[12 marks]**