Problem 3 (15%)

The normalised radiation intensity of a given antenna is given by: $U = cos(2\theta)$.

The intensity exist only in the $0 <= \theta <= \pi/2$, $0 <= \phi <= 2\pi$ region and is zero elsewhere. Find

3.a (10%) the exact directivity (dimensionless and in dBi).

3.b (5%) the azimuthal and elevation plane half-power beamwidths in degrees (hint: an elevation plane is for a fixed ϕ).

Problem 4 (35%)

A Bluetooth receiver operating at 2500 MHz need 50 picro Watt for errorfree transmission and receive its signal from a 0 dBm transmitter by a half wave dipole antenna connected to the receiver. The transmitter can use a 50 by 50 mm antenna area.

4.a (15%) Find the maximum distance of communication if freespace propagation can be assumed.

4.b (5%) Give under which conditions the maximum distance is obtained.

4.c (5%) Find the maximum distance if the reader uses circular polarization.

4.d (10%) If the receiver and transmitter is operated above a perfect reflecting surface, what is then the maximum distance. Assume the height of both the receiver and transmitter is one meter above the reflection surface.