KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF ELECTRICAL ENGINEERING

EE 422	ANTENNA THEORY	EXAMINATION I
Second Semester (092)		March 28, 2010

NAME :	
I.D. # :	

Q.1 The normalised radiation intensity of an antenna is given by: $U(\theta,\phi)=\sin^4\theta\cos^2\phi$. The intensity exists in the region $0\le\theta\le\pi$ and $-\frac{\pi}{2}\le\phi\le\frac{\pi}{2}$, and is zero elsewhere. Find:

a. The exact maximum directivity (dimensionless and in dB).
b. The azimuth and elevation half power beam-widths. Specify which planes you are selecting.
c. The antenna beam solid angle (Ω_A).
d. The antenna maximum power gain, if the antenna loss resistance is 5 Ω and its radiation resistance in 120 Ω.

Q.2

a. Calculate the exact directivity of an antenna with radiation intensity given by: $U=U_m\cos^N\theta$ for $0\le\theta\le\frac{\pi}{2}$ **and** $0\le\phi\le2\pi$**.**
b. Calculate the half-power beam-widths in two perpendicular planes containing the direction of maximum radiation, when N=3.
c. Calculate the approximate directivity when N=3, and find the percentage error from the exact value.

Q.3 a. Derive Friis Transmission formula, i.e. the received power P_r in a receiving antenna in terms of the transmitted power P_t and the transmitting and receiving antenna parameters.

b. A transmitting and receiving antennas are separated by 25 km. The frequency of operation is 10 GHz. The maximum effective apertures for both antennas are 1.5 m^2 each. The VSWR on the transmitting and receiving lines is 1.5. Calculate the received power if the power delivered to the transmitting antenna is 100 W and both antennas are polarization matched.

PROBLEM #	Q. 1	Q.2	Q.3	TOTAL
Marks				
Maximum	**35**	**30**	**35**	**100**