KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

DEPARTMENT OF ELECTRICAL ENGINEERING

EE 422 **Antenna Theory**

Computer assignment # 1

Objective

The purpose of this assignment is to compute the directivity of an antenna from knowledge of its radiation intensity function $U(\theta,\phi)$. Also, to plot the radiation pattern versus θ for a given value of ϕ.

Programming Environment

This assignment will be carried out on a PC running Windows operating system and running MATLAB for windows.

In order to compute the directivity, we need to use a numerical integration similar to the procedure outlined in the textbook (chapter 2). The function supplied in MATLAB to perform such numerical integration is quad and quad8. These are numeric function integration functions. They have the form:

q = quad('fun',a,b) or q = quadl('fun',a,b)

quad and quadl return the results of numerically integrating the function fun(x) between the limits a and b.

i.e. $q = \int_a^b fun(x)\,dx$

quad uses Simpson's rule while quad8 used Newton Cotes 8 panel rule.

Example:
```
a = quadl('sin',0,pi)
a =
     2.0000
```

Guidelines

- Familiarize yourself with the operation of MATLAB. Practice performing some calculations. Use the Demo and the Help commands. Try the following:

```
>> 2*3
    ans=6
>> a=2*3
   a=6
>> theta=0:.05:pi;
```

```
>> u=sin(theta);
>> plot(theta,u)          size and position the graphics window
>>grid                   To show a grid on the screen
```

- Create two m-files to represent the functions f(θ) and g(ϕ), e.g. fun1.m and fun2.m using the notepad editor.

  Suppose $U(\theta,\phi)=\sin(\theta)\sin(\phi)$
  Then fun1.m should contain:

```
function y=fun1(x)
y=sin(x).*sin(x);
y=abs(y);
```

  & fun2.m should contain:

```
function y=fun2(x)
y=sin(x);
y=abs(y);
```

- To compute the directivity you can use the following command:

```
>> D0 = (4*pi./(quadl('fun1',0,pi).*quad8('fun2',0,pi))
```

- Use the above outlined procedure to solve problem (2.7). Compare the computed values to the results obtained in home work # 1.
- Draw the radiation patterns for the given functions (versus θ for a given value of ϕ) using the plot and polar commands.