Exp1: Study Of Total Internal Reflection

(i) Single mode and Multimode

Code:

n1=1.47; %core

n2=1.46; %cladding

lamda=1550\*(10^(-9));

as=3\*10^(-6);

am=25\*10^(-6);

thetai=input('Enter incidence angle in degrees=')

na=sqrt((n1\*n1)-(n2\*n2))

thetaa=asind(na)

phic=asind(n2/n1)

vs=(2\*pi\*na\*as)/lamda

vm=(2\*pi\*na\*am)/lamda

m=(vm\*vm)/2

phi=acosd(sind(thetai)/n1)

if(thetai<thetaa)

if(phi<phic)

display('Total internal reflection absent')

else

display('Total internal reflection present')

end

else

display('Total internal reflection absent')

end

Output:

Enter incidence angle in degrees=5

thetai = 5

na = 0.1712

thetaa = 9.8560

phic = 83.3131

vs = 2.0816

vm = 17.3469

m = 150.4575

phi = 86.6010

Total internal reflection present

(ii) Refractive Index Profile

Code:

n1=1.47;

n2=1.46;

a=25;

delta=((n1\*n1)-(n2\*n2))/(2\*n1\*n1);

alpha=1;

r=-50:1:50

for i=1:1:length(r)

if(abs(r(i))<=a)

n(i)=n1\*sqrt((1-(2\*delta\*((abs(r(i))/a)^(alpha)))));

end

if(abs(r(i))>a)

n(i)=n2;

end

end

subplot(2,2,1);

plot(r,n)

grid on;

xlabel('Radial Distance');

ylabel('Refractive Index');

title('For alpha=1')

alpha1=2;

r=-50:1:50

for i=1:1:length(r)

if(abs(r(i))<=a)

n(i)=n1\*sqrt((1-(2\*delta\*((abs(r(i))/a)^(alpha1)))));

end

if(abs(r(i))>a)

n(i)=n2;

end

end

subplot(2,2,2);

plot(r,n)

grid on;

xlabel('Radial Distance');

ylabel('Refractive Index');

title('For alpha=2')

alpha2=4;

r=-50:1:50

for i=1:1:length(r)

if(abs(r(i))<=a)

n(i)=n1\*sqrt((1-(2\*delta\*((abs(r(i))/a)^(alpha2)))));

end

if(abs(r(i))>a)

n(i)=n2;

end

end

subplot(2,2,3);

plot(r,n)

grid on;

xlabel('Radial Distance');

ylabel('Refractive Index');

title('For alpha=4')

alpha=inf;

r=-50:1:50

for i=1:1:length(r)

if(abs(r(i))<=a)

n(i)=n1\*sqrt((1-(2\*delta\*((abs(r(i))/a)^(alpha)))));

end

if(abs(r(i))>a)

n(i)=n2;

end

end

subplot(2,2,4);

plot(r,n)

grid on;

xlabel('Radial Distance');

ylabel('Refractive Index');

title('For alpha=inf')