20F-ECENGR170A-1 Midterm

KARUNESH SACHANANDANI

TOTAL POINTS

25 / 25

QUESTION 1

1 10 / 10

✓ - **0 pts** Correct

- **3 pts** partially incorrect

- **10 pts** incorrect

QUESTION 2

2 15 / 15

✓ - **0 pts** Correct

- **5 pts** plot incorrect

- **3 pts** plot incorrect

- **10 pts** incorrect

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```
% EE 170A Midterm - Karunesh Sachanandani 304711943
% Q1
figure;
thi = 0:0.1:90;
n1 = 1.74;
si = sind(thi);
ci = cosd(thi);
bi = sqrt(n1*n1-si.*si);
di = n1*n1*ci;
rp = (bi-di)./(bi+di);
rs = (ci-bi)./(ci+bi);
rp2 = abs(rp).*abs(rp);
rs2 = abs(rs).*abs(rs);
plot(thi,rp2,thi,rs2);
xlabel('Incidence Angle (degrees)');
ylabel('Reflectance');
legend('Reflectance of p-polarized component', 'Reflectance of s-polarized component');
```
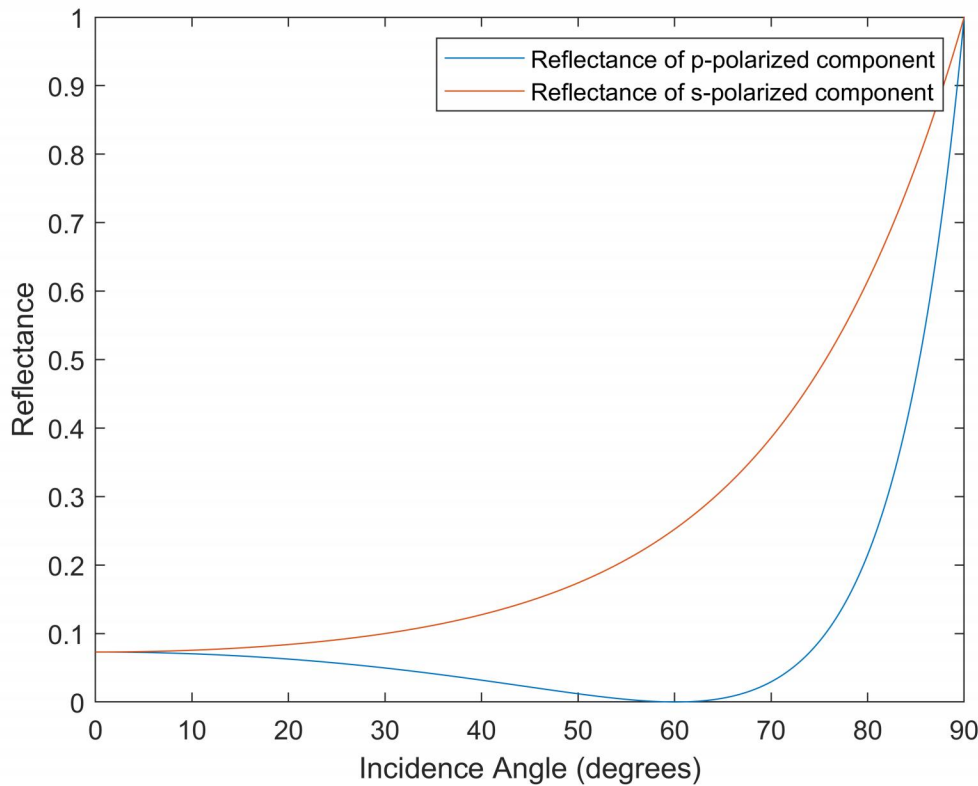


```
% Q2
figure;
d = 1250;
angi = 25;
sangi = sind(angi);
% First we need to find the max wavelength that produces valid diffraction
% angles for each m. we call this angle: lam max
% For m = -1,-2,-3: sin(angm) = -1 produces lam max
lammaxminusone = (sangi+1)*d
```

1 10 / 10

   ✓ **- 0 pts** **Correct**

     - 3 pts partially incorrect

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gradescope

```
% EE 170A Midterm - Karunesh Sachanandani 304711943
% Q1
figure;
thi = 0:0.1:90;
n1 = 1.74;
si = sind(thi);
ci = cosd(thi);
bi = sqrt(n1*n1-si.*si);
di = n1*n1*ci;
rp = (bi-di)./(bi+di);
rs = (ci-bi)./(ci+bi);
rp2 = abs(rp).*abs(rp);
rs2 = abs(rs).*abs(rs);
plot(thi,rp2,thi,rs2);
xlabel('Incidence Angle (degrees)');
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legend('Reflectance of p-polarized component', 'Reflectance of s-polarized component');
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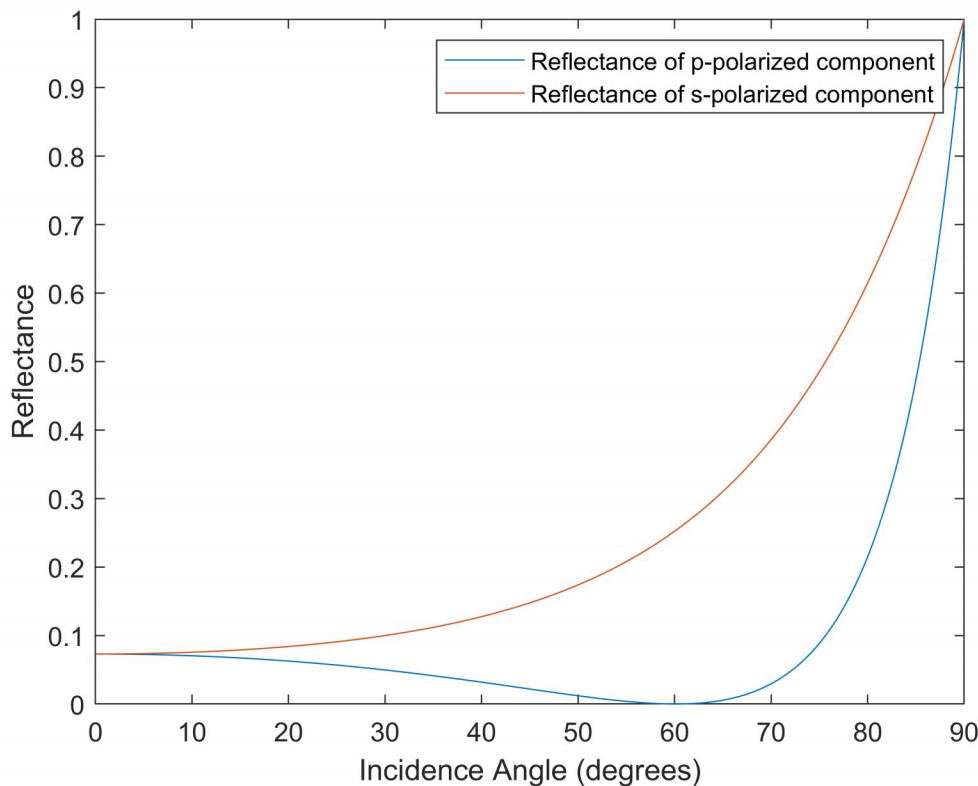


```
% Q2
figure;
d = 1250;
angi = 25;
sangi = sind(angi);
% First we need to find the max wavelength that produces valid diffraction
% angles for each m. we call this angle: lam max
% For m = -1,-2,-3: sin(angm) = -1 produces lam max
lammaxminusone = (sangi+1)*d
```

```
lammaxminusone = 1.7783e+03
```

```
lammaxminustwo = (sangi+1)*d/2
```

```
lammaxminustwo = 889.1364
```
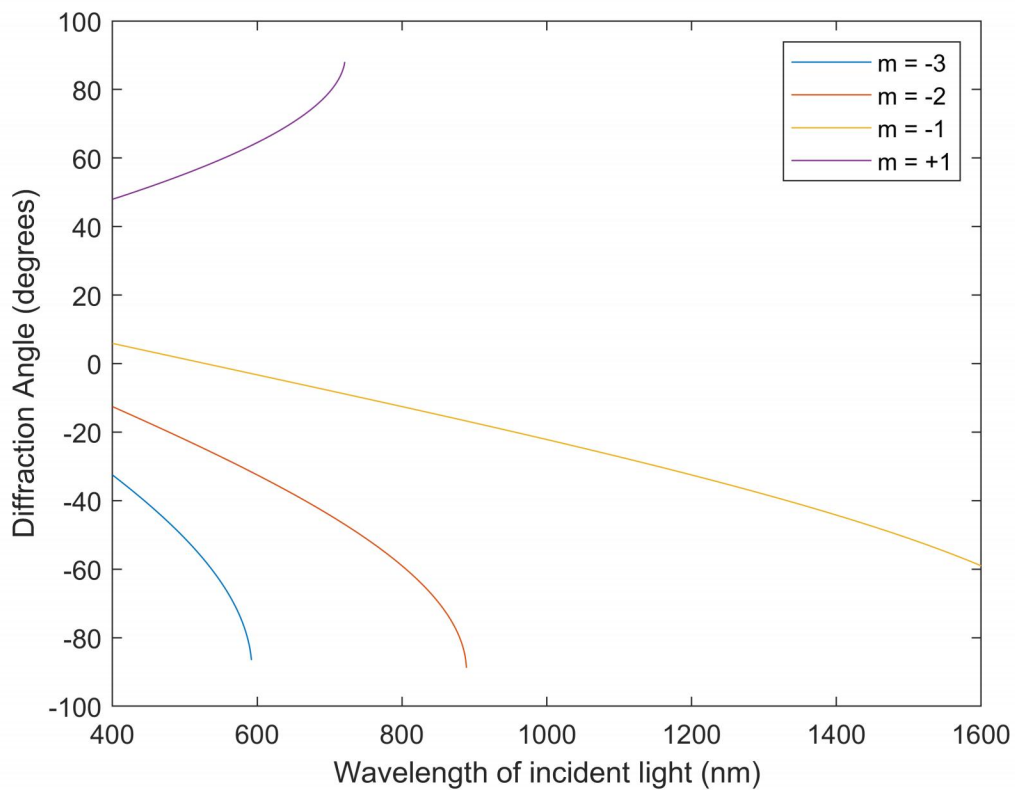
```
lammaxminusthree = (sangi+1)*d/3
```

```
lammaxminusthree = 592.7576
```

```
% For m = 1: sin(angm) = +1 produces lam max
lammaxplusone = (1-sangi)*d
```

```
lammaxplusone = 721.7272
```

```
% Now since lam max for m = -1 > our max wavelength value of 1600 nm for
% our graph, we can plot the graph for the entire range
lammaxminusone=1600;
lamminusone = 400:1:lammaxminusone;
lamminustwo = 400:1:lammaxminustwo;
lamminusthree = 400:1:lammaxminusthree;
lamplusone = 400:1:lammaxplusone;
sangminusone = sangi - lamminusone/d;
sangminustwo = sangi - 2*lamminustwo/d;
sangminusthree = sangi - 3*lamminusthree/d;
sangplusone = sangi + lamplusone/d;
angminusone = asind(sangminusone);
angminustwo = asind(sangminustwo);
angminusthree = asind(sangminusthree);
angplusone = asind(sangplusone);
plot(lamminusthree,angminusthree,lamminustwo,angminustwo,lamminusone,angminusone,lamplusone,ang
xlabel('Wavelength of incident light (nm)');
ylabel('Diffraction Angle (degrees)');
legend('m = -3', 'm = -2', 'm = -1', 'm = +1');
```

Diffraction Angle (degrees) vs Wavelength of incident light (nm)

Legend:
- m = -3
- m = -2
- m = -1
- m = +1

2 15 / 15

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