HW1:

Q1: (a) 11.54^o , (b) 8.65^o , (c) 82.7^o

Q2: 0.262, 15.17^o

Q3: (a) 0.64 mm, (b) 12 mm

Q4: 0.5

HW2:

Q1: (a) 2.3 nm, (b) LD

Q2: 3.3 ns/km

Q3: 0.075 ns/km

Q4: (a) 2.1 MHz, (b) 93.3 MHz, (c) 2.1 Mbps, (d) 186.6 Mbps

HW3:

Q1: (a) 41.8^o , (b) 0.326, 1.326, (c) $e^{-j\,60.84^o}$, 1.488-j0.873=$1.725e^{-j\,30.4^o}$,
(d) for part (b) [0.326, 0^o], for part (c) [1, -60.84^o].

Q2: (a) 41.8^o , (b) $e^{-j\,105.72^o}$, (c) 1, $-105.72^o \equiv 254.28^o$,(d) 33.69^o

Q4:

(a) $\vec{E}_r = \vec{a}_y e^{j\,(10^{15}\pi t + 10^7 x - 1.2\times 10^7 z - 60.84^o)}$ V/m

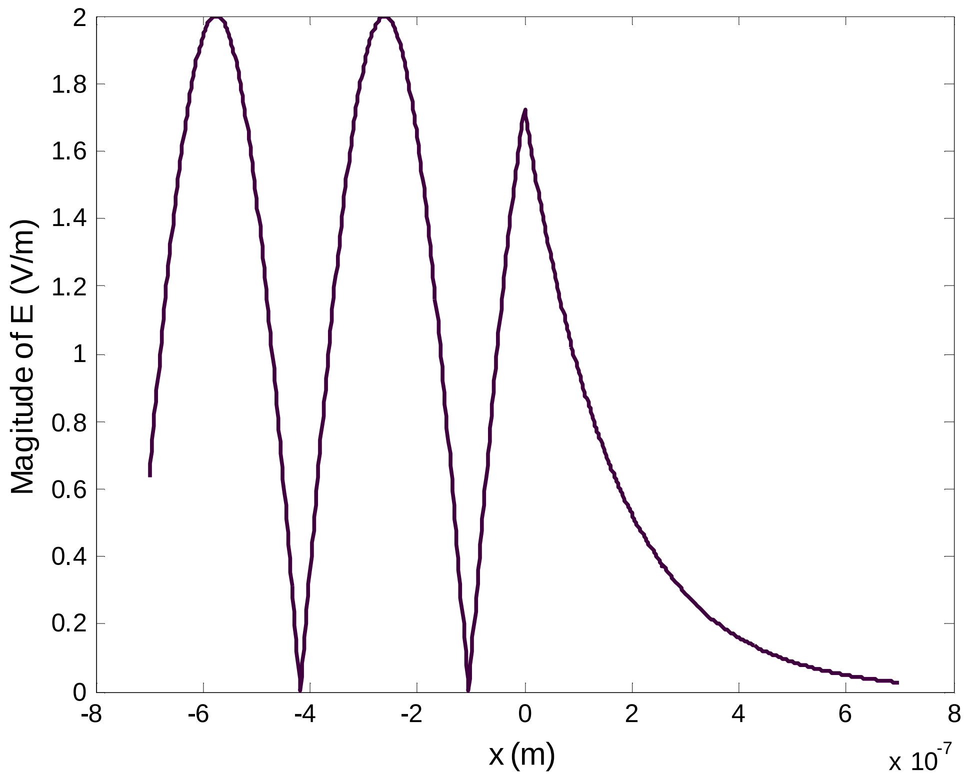
(b) $\vec{E}_t = \vec{a}_y\, 1.725 e^{-5.93\times 10^6 x} e^{j\,(10^{15}\pi t - 1.2\times 10^7 z - 30.4^o)}$ V/m

(c) $\vec{E}_1 = \vec{E}_i + \vec{E}_r = \vec{a}_y e^{j\,(10^{15}\pi t - 1.2\times 10^7 z)} [e^{-j\,10^7 x} + e^{j\,(+10^7 x - 60.84^o)}]$

(d) $\left|\vec{E}_1\right| = \left|[e^{-j10^7 x} + e^{j\,(+10^7 x - 60.84^o)}]\right| = 2\left|\cos(10^7 x - 30.42^o)\right|$ (valid for $x < 0$)

$\left|\vec{E}_2\right| = \left|\vec{E}_t\right| = 1.725 e^{-5.93\times 10^6 x}$ (valid for $x > 0$)

The distance x in the above two expressions is in meters. The resulting plot



Q5: (a) $\theta_i > 41.8^o$ (b) $\theta_i < 41.8^o$ (c) $\theta_i > 41.8^o$

Q6: (a) $3.361 Np/\mu m$ (b) $10 V/m$ (c) $0.347 V/m$ (d) $2.53\times10^{-14} V/m \approx 0$

HW4:

Q3: (a) 3.775 (b) 3 (c) 4 (d) 4 (e) 1

Q4: (a) 6 (b) 6 (c) 12 (d) $1.5 < n_1 < 1.50083$ (e) $1.50333 < n_1 < 1.50748$

Q5: $6.4583 \mu m$

HW5:

Q1: $6.76\times10^{-11} s/m$

Q3: (a) $6.76\times10^{-11} s/m$ (b) $2.75\times10^{-11} s/m$ (c) 0 (d) $3.57\times10^{-10} s/m$

Q4: (a) $5.18\times10^{9} Hz.m$
(b) i) $5.18\times10^{11} Hz$ ii) $5.18\times10^{9} Hz$ iii) $5.18\times10^{6} Hz$ iv) $5.18\times10^{4} Hz$

Q5: $3.57\times10^{-10} s/m$

HW6:

P2.11: $129.4\mu m$ $91.5\mu m$ (based on single count of modes)
$91.5\mu m$ (based on double count of modes)

P2.13: 0.172

P2.16: $1.211\mu m$, $4.37\mu m$ (based on single count of modes)
$0.856\mu m$, $3.09\mu m$ (based on double count of modes)

P2.17: 94 modes based on double count and 47 modes based on single count,
V= 3.446 .

P2.18: $1.927\mu m$ (note: textbook's answer is incorrect. This value of wavelength will be used in problem P2.19)

P2.19: 0.49% (note: answer in textbook is incorrect)

HW7:

Q1: (a) $1.11 ns/km$ (b) $315 MHz.km$

Q2: (a) $180 ns/km$ (b) $1.95 MHz.km$

Q3: (a) $30 ps/km$ (b) $11.7 GHz.km$

Q4: Answer according to the problem is $n_1 = 0.6311$. This answer is unrealistic, because fibers are usually made of glass with a refractive index of around 1.50.

However, if the pulse spread is changed from $350 ps$ to $850 ps$, we get the realistic answer $n_1 = 1.5326$.

Q5: (a) $2.44 MHz$ (b) $1.54 MHz$

HW8:

P3.1: 57.5 km

P3.2: $10.24\mu m$

P3.3: $703\mu W$

HW9:

P6.6: $0.075\mu m$

P6.8: (a) 1.378-1.908 e.v. (b) 0.729-1.348 e.v.

P6.9: $0.0376 A/cm$

P6.10: $27.94 Np/cm$