Quiz3

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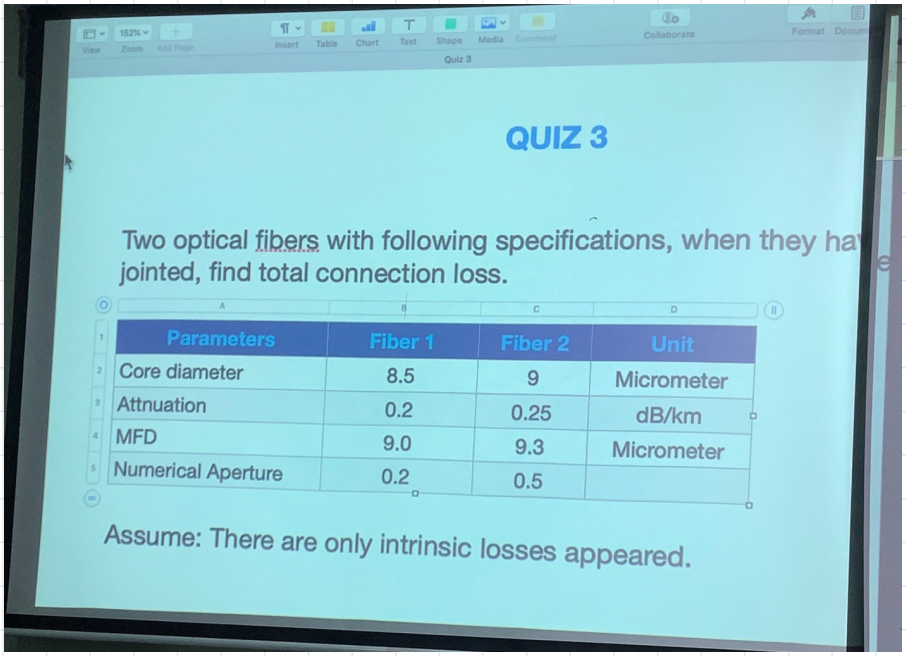
Optical Eng (PAK)



QUIZ 3

Two optical fibers with following specifications, when they ha
jointed, find total connection loss.

Parameters	Fiber 1	Fiber 2	Unit
Core diameter	8.5	9	Micrometer
Attnuation	0.2	0.25	dB/km
MFD	9.0	9.3	Micrometer
Numerical Aperture	0.2	0.5	

Assume: There are only intrinsic losses appeared.

① Core Diameter ($a_1 = 8.5\ \mu m$, $a_2 = 9\ \mu m$)

From $Loss_{core} = -10\log\left[(a_2/a_1)^2\right]$ dB

$$= 10\log\left[\left(\frac{9\times10^{-6}}{8.5\times10^{-6}}\right)^2\right]$$

$\therefore Loss_{core} = 0.49647$ dB ※

② คำนวณ loss ไม่ได้ ไม่ทราบ Distance.

③ MFD ($MFD_1 = 9\ \mu m$, $MFD = 9.3\ \mu m$)

$$Loss_{MFD} = -10\log\left[\frac{4}{\left(\frac{MFD_1}{MFD_2} + \frac{MFD_2}{MFD_1}\right)^2}\right]$$

$$= 10\log\left[\frac{4}{\left(\frac{9\times10^{-6}}{9.3\times10^{-6}} + \frac{9.3\times10^{-6}}{9\times10^{-6}}\right)^2}\right]$$

$\therefore Loss_{MFD} = 4.66857\times10^{-3}$ dB ※

④ NA ($NA_1 = 0.2$, $NA_2 = 0.5$)

$$Loss_{NA} = -10\log\left[(NA_2 / NA_1)^2\right]$$

$$Loss_{NA} = 10\log\left[\left(\frac{0.5}{0.2}\right)^2\right]$$

$\therefore Loss_{NA} = 7.9588\ dB$ #

total Connetion loss = $0.19647\ dB + 4.66857\times10^{-3}\ dB + 7.9588\ dB$

$\therefore$ total Connetion loss = $8.159357\ dB \approx 8.16\ dB$ #