NAVAL POSTGRADUATE SCHOOL
Monterey, California

EC 3550 MIDTERM EXAM I 4/99 Prof. Powers

- This exam is open book and notes.
- There is a 50 minute time limit.
- There are three problems; each is equally weighted.
- Partial credit will be given; be sure to do some work on each problem.
- Be *sure* to include units in your answers.
- Please circle or underline your answers.
- Do *NOT* do any work on this sheet.
- Show *ALL* work.

1	
2	
3	
Total	

Name: _____

1. An OTDR operates at 850 nm with a pulse width of 1 ns and a dynamic range of 27 dB. It is to be used with a 50/125 fiber with a loss of 0.45 dB/km at the operating wavelength and a core index of refraction of 1.460.

   (a) Find the resolution of the OTDR (i.e., the shortest feature length that the OTDR can resolve).

   (b) Find the maximum length of fiber that can be measured with this OTDR.

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2. A graded-index single-mode fiber has a refractive index profile given by

$$n(r) = \begin{cases} 1.460\sqrt{1 - \dfrac{0.016r}{4.2 \times 10^{-6}}} & r < 4.2\ \mu\text{m} \\ 1.448 & r \geq 4.2\ \mu\text{m} \end{cases}$$

   Calculate the cutoff wavelength of this fiber.

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3. An officer wants to construct a 500 Mb/s data link using 62.5/125 fiber. She wants to use an LED that radiates at 680 nm with a spectral linewidth of 50 nm. The modal dispersion of the fiber at this wavelength is 48.7 ps/km.

   Calculate the maximum transmission distance for this link, assuming that the distance is limited by the dispersion of the fiber.