

NAVAL POSTGRADUATE SCHOOL  
Monterey, California

EC 3550

MIDTERM EXAM I

10/93 Po

- This exam is open book and notes.
- 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. A 6/125 single-mode graded-index fiber has a profile parameter of 1.8 and a cladding index of 1.480. The cutoff wavelength of the fiber is  $1 \mu\text{m}$ . Find the value of  $\Delta$ .
- 

2. Consider a 62.5/125 graded index fiber with  $n_1 = 1.470$  and  $n_2 = 1.450$ . The optimum profile parameter is 1.85, but the actual profile parameter of a fiber sample is found to be 2.00. You may assume that the total dispersion of this fiber is dominated by modal dispersion.
    - Find the data-rate-bandwidth product (*in units of  $\text{Mb}\cdot\text{s}^{-1}\cdot\text{km}$* ) for the sample of fiber.
    - Find the maximum data-rate-bandwidth product (*in units of  $\text{Mb}\cdot\text{s}^{-1}\cdot\text{km}$* ) that could be achieved if the optimum profile parameter could be realized.
- 

3. Consider a fiber link operating at 800 nm. The fiber has a core index of 1.46 and a  $\Delta$  of 1.5%. The  $\Delta\tau$  due to the material dispersion of the link is measured as  $-100 \text{ ps}$ . The  $\Delta\tau$  of the link due to modal dispersion is measured as  $+70.1 \text{ ns}$ . Find the spectral width  $\Delta\lambda$  of the source.