NAVAL POSTGRADUATE SCHOOL
Monterey, California

EC 3550 MIDTERM EXAM I 10/98 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.

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|---|---|
| 1 | |
| 2 | |
| 3 | |
| Total | |

Name: _____

1. An optical fiber link has an input power of $-4$ dBm. The optical power at a 30-km distance is 3.98 $\mu$W. What is the optical power (in watts) at a distance of 22 km? (Your computation *must* be done using dBm and dB.)

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2. Consider a 100/140 graded-index fiber operating at 850 nm. The fiber has a core index of 1.460 and a fractional difference in the index of refraction of 1.5%. The $g$-parameter value is 1.95.

   (a) Calculate the number of modes in the fiber.

   (b) Find the normalized pulse spread due to modal dispersion (in units of ps/km).

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3. Consider a single-mode fiber with a normalized waveguide dispersion of $-8$ ps·km$^{-1}$·nm$^{-1}$, operating at 1550 nm with a source linewidth of 10 nm. Calculate the maximum bandwidth-distance product (in units of MHz·km) for this combination of fiber and source.