NAVAL POSTGRADUATE SCHOOL
Monterey, California

EC 3210 | MIDTERM EXAM I | 10/97 Prof. Powers

- 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.
- Enter your name in the space provided.

1	
2	
3	
Total	

Name: _____

1. A Michelson interferometer operates with an argon laser at a 548-nm wavelength. The measured fringe period is 1.0 mm.

   (a) Find the angle misalignment of the plane waves coming out of the interferometer (in degrees).

   (b) Suppose that one of the mirrors of the interferometer moves 0.01 mm. Calculate the distance that a fringe will move as a result of this mirror motion.

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2. A laser designator operates at 1.06 μm with a full-angle beam divergence of 0.1 milliradians. The laser produces rectangular-shaped pulses in the time domain with a FWHM pulse width of 10 ns. At a pulse repetition rate of 30 pulses per second, the average power out of the laser is 3 mW.

   (a) Calculate the peak power of the laser.

   (b) Calculate the peak irradiance (in $\mathrm{W{\cdot}m^{-2}}$) found at location that is 7 km from the laser.

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3. A half-wave plate designed to operate at 632.8 nm is oriented with its fast axis (y') horizontal and its slow axis (x') vertical. The incident beam (at a wavelength of 632.8 nm) is right elliptically polarized. The major axis of the polarization is horizontal and the minor axis is vertical. The major axis is twice the length of the minor axis.

   Describe (completely) the state of polarization at the output of the half-wave plate.