

III B.Tech II Semester Supplementary Examinations, April/May 2005
OPTO ELECTRONIC AND LASER INSTRUMENTATION
(Electronics & Instrumentation Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Explain about the light guidance in a optical fibre with figures, and explain the total internal reflection and Numerical aperture with diagrams and equations
(b) Explain about the single mode fibres with figures.
2. (a) Compare Optical fiber communication system with Microwave communication system.
(b) Discuss about the various applications of optical fibers in detail.
3. (a) Explain synchronously mode-locked laser system.
(b) Find maximum power, threshold population density, pulse duration and total energy of a Q switched pulse for a ruby laser with following characteristics
Length of the rod = 0.1m, area of cross section = 1 cm^2 ,
resonator length = 10 cm, mirror reflectivity = 1 and 0.7,
 Cr^{3+} population density = $1.58 \times 10^{19} / \text{cm}^3$, $\lambda_0 = 6943 \text{ Å}$,
 $n_0 = 1.76$, $t_{sp} = 3 \times 10^{-3} \text{ s}$, $g(\omega_0) = 1.1 \times 10^{-12} \text{ s}$.
4. (a) Compare and contrast double exposure interferometry and real time interferometry.
(b) Write in detail about IR detectors.
5. (a) Differentiate between a transducer and a sensor.
(b) Explain a method for measurement of current by a single mode fiber optic sensor with the help of a diagram.
(c) How do you estimate the transmission line loss using the above sensor.
6. (a) With a neat sketches explain the operation of Laser Doppler velocity meter.
(b) With a neat diagram explain the operation of laser endoscope.
7. (a) With the help of neat sketches explain reconstruction of hologram with a wave identical to reference wave and with a wave conjugate to reference wave?
(b) Explain in detail various recording and reconstruction devices of hologram?
8. (a) Differentiate between Magneto - optic and Acusto - optic modulators.
(b) Why acousto - optic modulators have to be used at low acoustic frequencies.
