



Optical communication (610535)3

Instructor: Dr. Abdel-Rahman Al-Qawasmi

Semester: Incomplete

Exam: Final

Prerequisite :Communication II

Engineering Faculty

Electrical & communication Dept.

Date : 9/3/2004

Time : 2 Hour

Question1 :(10 marks)

- Explain the effect of temperature on LD. Why this occurs , and give two methods to reduce this effect.
- Write the four packaging requirements for LD.

Question2 :(7 marks)

- Compute the current amplification in photomultiplier tube if the gain at each dynode is 5 and there are nine dynodes.
- What is the major limitation to high-frequency modulation? Explain.
- Write three advantages of LD over LED.

Question3 :(8 marks): A lighting-Emitting Diode is modulated by a current Source with frequency 100 Mega Hertz and peak Signal Current 98 mA. If a dc bias current equal 10 mA:

- 1- Compute Total Diode current when $t=3$ micro Seconds
- 2- Determine the Peak Signal Power if the Carrier Life Time = 2 ns and Slope=1.
- 3- F_{3-dB}

Question4 :(15 marks)

Compute the power and bandwidth for communication analog system that transmits a video signal by Internet and using SI multimode Fiber. The system has the following requirements:

- 1- Signal bandwidth 6 MHz.
- 2- Signal to noise ratio $S/N=10^7$
- 3- LED with range $(0.8-0.9)\mu\text{m}$
- 4- Silicon PIN photodetectors with capacitance=4pF, Responsivity=0.5 A/W, equivalent temperature 400 K and $V_{\text{bias}}=4$ V. (k -Boltzman constant= $1.38.10^{-23}$)
- 5- Multimode SI fiber, $NA=0.25$, optic bandwidth $f_{3-dB} \times L=30$ MHz X Km, loss of 5dB/km and 50- μm core diameter.

Question5 :(10 marks)

Find the output current of a photodetector whose quantum efficiency is 0.9, the wavelength is 1.3 μm and the incident power level is -37 db. Also compute the resulting output voltage if the load resistance is 50 ohm, and 1000 ohm.

GOOD LUCK