University of Mansoura
Faculty of Engineering
Dept. of Electronics & Communs
3rd Year Electronics

Course Code :9325
Time : 3 hrs
Date: 4/6/2013
(Full Mark : 70)

Optical Electronics

USE NEAT SKETCHES TO CLARIFY YOUR ANSWERS:

1) A- The SEA-ME-WE undersea optical cable connects more than 20 countries in 3 continents, state the advantages of the optical communications and sketch the cross-section of optical fiber cable showing its main parts and the function of each part.
   B- Define the following terms of optical fiber:
   Guided modes – acceptance angle – original and conventional spectral bands

2) A- Derive an expression for the numerical aperture in optical fiber and use it to get the total number of modes in multimode fiber.
   B- Define the information capacity of optical link and derive the cut-off condition in optical fiber.

3) A- Define the attenuation factor in optical fiber and compare between the different causes of attenuation.
   B- A 12 km-optical fiber has attenuation factor 1.5 dB/km. What is the minimum optical power that must be put into the fiber to get 0.3 μw at the receiving end?

4) A- Derive an expression for material dispersion factor and explain how to minimize it.
   B- Derive an expression for the intermodal dispersion and explain how to minimize it.
   C- Give a short account on design optimization in single mode fiber.

5) A- Derive an expression of the gain in laser diode and explain how to maximize it.
   B- Sketch the layer structure of LED used in optical fiber link at 1550 nm and explain the function of each layer.

6) A- State the requirements of photo detectors used in optical fiber and they are realized in silicon avalanche photo diode.
   B- Derive an expression for the quantum efficiency of photo diode and explain the condition of cut-off wave length for different materials.

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