Even Semester Examination 2013

Optoelectronics & Optical Communication (ET 801)

Question 1 is compulsory and answer any four from the rest. 2 marks are reserved for brief and precise answers.

Time: 03 Hrs

1) Why (Any Five)
   a) Laser beams are used for surgical procedures
   b) All laser diodes have a Fabry Perot cavity as its integral part
   c) The core region of a GRIN fibers are prepared with parabolic variations of refractive index.
   d) Isolation resistance of an Opto-Coupler cannot be measured by a Digital Multimeter
   e) Currently, optical fiber communication is essentially REPEATERLESS Communication
   f) Thin film Hetrojunction solar cells are normally not preferred for terrestrial PV applications.

   5x4=20

2) a) List only the different LED's that are utilized in displays and in fiber optic communication.
   b) What is the specific advantage of using Ternary hetrostructure alloys as LED's? Illustrate with examples. How are the semiconductors chosen for fabricating such devices?
   c) On what factors does the light coupled from an SLED into a fiber optic cable depends?

   2+6+4

3) a) The power generated internally within a DH LED is 28.4mW at a drive current of 60.0mA. Determine the peak emission wavelength from the device when the radiative and non-radiative recombination lifetimes of the minority carriers in the active region are equal. Deduce necessary relations.
   b) Outline briefly the common features of all LCD materials & compare a few of them with LED's.

   5+3+4

4) a) Define Noise equivalent power(NEP) of a photodiode & deduce an expression for the same when photocurrent dominates over dark current.
   b) Draw a neat sketch of an experimental arrangement for measuring spectral response of an LDR. If the response contain two peaks one at 0.52 micron and the second one at 0.59 microns, how can you interpret the result physically?

   6+6

5) a) Consider a silicon P-I-N photodiode with an intrinsic region of thickness 10.0μm. Photons of energy 1.43eV strikes the photodiode with an optical power of 1.0watt/cm^2. Assuming the photocurrent to be constituted of EHPS produced within the depletion region, estimate the photocurrent density with necessary deductions & reasoning.
   b) Draw a neat sketch of a full optical DE-MUX, using two information channels and mention the role of each component very briefly.

   7+5

6) a) Draw a neat sketch of the core & cladding regions of a fiber & explain the terms: Meridional Rays, Cladding Rays. Acceptance angle. Show how Acceptance angle is related to the estimate of Numerical Aperture.

b) An SI fiber has a solid acceptance angle of 0.115 radians in air and a relative refractive index difference of 0.9%. Estimate the velocity of light proceeding through the fiber core region.

6+6

7) a) Draw a neat cross-sectional view of a MMSI & MMGI cable along with standard equations followed for expressing their R.I. profiles.

b) What is Material Dispersion in SM fibers? How can it be minimized?

c) One MMSI fiber has a core refractive index of 1.5 and relative R.I. difference of 1.0%. The number of modes propagating in the second window of optical communication is 1100. Estimate the core diameter of the fiber.

5+3+4

8) Write appropriate technical notes on (Any Two):

a) Fabrication of Fiber PREFORMS

b) Bi-directional WDM link & its figures of merit

c) Different opto coupler configuration & their figures of merit

d) Signal degradation in Optical fibers

6x2