Code No: NR410404 **NR**

IV B.Tech I Semester Supplementary Examinations, November 2005
OPTICAL COMMUNICATION
(Common to Electronics & Communication Engineering and Electronics & Telematics)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Bring out a brief historical development of optical fiber communication. [6]
   (b) Draw the block schematic of a general communication system and explain about each block. [4+6]
2. (a) Define an optical fiber. Explain in detail different types of optical fibers giving neat sketches. [2+10]
   (b) Define and explain V-number [4]
3. (a) Discuss briefly about radiative losses in the optical fiber [8]
   (b) Explain the core and cladding losses in the optical fiber and also derive the expression for those losses [4+4]
4. (a) With respect to LED what is internal quantum efficiency and derive the expression for the lifetime reduction caused by interfacial recombination. [3+5]
   (b) If the radiative and non radiative recombination lifetimes of the minority carriers in the active region of an LED are 1ns and 100ns, respectively, find the internal quantum efficiency and the bulk recombination lifetime in the absence of self absorption and recombination at the heterojuntion. [4+4]
5. (a) Discuss about the linearity of the optical source. What are the compensation techniques for linearization of Laser. [5+3]
   (b) A Gas laser emitting at 800nm has a 400μm long cavity with a refractive index n=3.6. If the gain g exceeds the total loss at throughout the range 750nm$< \lambda <$850nm, how many modes will exist in the laser? Also find the frequency separation of the modes. [4+3]
6. (a) What are the requirements of an optical receiver? Using a flow chart explain the receiver design. [4+4]
   (b) Derive an expression for receiver sensitivity. [8]
7. (a) Describe with diagram to explain the operation of a unidirectional WDM system.
   (b) Discuss about a bidirectional WDM system. [8+8]
8. (a) A GaAs optical source that has a refractive index of 3.600 is closely coupled to a step-index fiber which has a core refractive index of 1.465. If the source

size is smaller than the fiber core, and the small gap between the source and the fiber is filled with a gel that has a refractive index of 1.305, what is the power loss in decibels from the source into the fiber?

(b) Explain about laser diode-to-fiber coupling? [6+10]

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