

**IV B.Tech I Semester Supplementary Examinations, April/May 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) Give the block diagram of a digital optical fiber communication system and explain the functions of each block.  
(b) With respect to band width explain how optical fibers are advantageous over coaxial cables.
2. (a) Explain numerical aperture with reference to ray theory transmission?  
(b) A silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.5 and a cladding refractive index of 1.47. Determine
  - i. Critical angle at the core cladding interface
  - ii. Acceptance angle in air for the fiber.
3. (a) Derive the expression for the waveguide dispersion also find the relationship between  $V$  and  $\beta$ .  
(b) A single mode fiber operating at the wave length of  $1.3\mu\text{m}$  is found to have a total material dispersion of  $2.81\text{ns}$  , and a total waveguide dispersion of  $0.495\text{ns}$  Determine the received pulse width and approximate bit-rate of the fiber if the transmitted pulse has a width of  $0.5\text{ns}$ .
4. (a) A single mode step-index fiber gives a total pulse broadening of  $95\text{ns}$  over a  $5\text{km}$  length. Estimate the Bandwidth length product for the fiber when a Non-return to zero digital code(NRZ) is used.  
(b) With the help of relevant expressions. Explain pulse spreading mechanism in graded index fibers.
5. (a) Discuss the requirement for population inversion in order that stimulated emission may dominate over spontaneous emission. Illustrate your answer with an energy level diagram of a laser.  
(b) Discuss the mechanism of optical feedback to provide oscillation and hence amplification within the laser. Indicate how this provides a distinctive spectral output from this device.
6. (a) Describe with relevant diagram about the signal path through optical data link via transmitter ,fiber and receiver giving the nature of the signal waveform.  
(b) What is a bit period? The bit frequency of the link is  $10^7\text{Hz}$ .On the average and one error is encountered in a second, find the value of BER (Bit Error Rate).

7. (a) Give an account of Fiber optic link rise time budget and its uses.  
(b) Explain about RZ and NRZ coding and their effects on the bit rate.
8. (a) Explain about Adhesive splicing?  
(b) Explain about Multiple splices?

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