Assignment No. 1

Subject:- Optical Communication
NEC-701

1. Draw the block diagram of optical fiber communication system. Enlist the advantages of optical communication.
2. A glass clad fiber is made with core glass of refractive index 1.5 and the cladding is doped to give a fractional index difference of 0.0005.Find **(a)** The cladding index **(b)** The critical internal reflection angle **(c)** The external critical acceptance angle **(d)** Numerical aperture.
3. The core diameter of multimode step index fiber is 80 micrometer. The difference in refractive indices is 0.015.The core refractive index is 1.48.Determine the normalized frequency for the fiber and number of guided modes when the operating wavelength is 0.85micrometer.
4. What are the criteria for selecting material for optical fiber? Describe vapor phase oxidation technique in preparation of low loss fiber.
5. Explain cut of wavelength, mode field diameter and effective refractive index.
6. Differentiate between SMF step index and SMF graded index.
7. Differentiate between intramodal and intermodal dispersion for step and graded index fibers.
8. Explain modal birefringence and beat length in SMF. What is polarization dispersion? Calculate pulse spread caused by PMD for a single mode fiber with PMD coefficient of 0.5ps$\sqrt{}$km and fiber length of 100km.
9. Explain fiber dispersion measurement technique.
10. What is Total Internal Reflection? Explain Snell's law.
11. Describe the mechanism of intermodal dispersion in multimode step index fiber. Derive an expression relating length of fiber L, numerical aperture of fiber, core's refractive index n_1 and velocity of light(c) in vacuum for the broadening of a light pulse ΔT_S due to intermodal dispersion in a multimode step index fiber.
12. A 6km optical link consists of multimode step index fiber with core refractive index of 1.5 and a relative refractive index Difference of 1%. Estimate: **(i)** The delay difference between the slowest and fastest modes at the fiber output. **(ii)** The rms pulse broadening due to intermodal dispersion on the link **(iii)** The maximum bit rate that may be obtained without substantial Errors on the link assuming only intermodal dispersion. **(iv)** The bandwidth- length product corresponding to **(iii)**

13. With the aid of suitable diagram briefly discuss the following:
    - **a)** Fiber bend losses
    - **b)** Dispersion shifted fibers
14. Describe Linear and Non- Linear scattering Losses.
15. A step index fiber in air has a numerical aperture of 0.16, core refractive index 1.45 and core diameter of 60μm.determine normalized frequency of fiber.

16. Explain intrinsic and extrinsic absorption in optical fiber material.
17. What is polarization mode dispersion?
18. Briefly explain the reasons of pulse broadening due to material dispersion in optical fibers.
19. A graded index fiber has a core with parabolic refractive index profile and diameter 40 μm. NA is 0.2. Estimate the total number of guided modes for wavelength of 1 μm.
20. Explain the concept of mode coupling.