Fiber Optics

UNIT 1

12 MARKS

With the aid of neat diagrams, discuss various components of optical fiber transmission

Derive the expression for Acceptance angle and Numerical Aperture

Describe in detail the methods adopted for the installation of fiber cables. Mention the precautions to be taken during the installation. (Advantages and disadvantages of FOOC)

Discuss in detail about the types of rays in ray optics

4 MARKS

Difference between step index and graded index

Difference between Single Mode and Multi Mode fiber

Snell's Law

Refractive index of core is higher than cladding

Explain how attenuated signals are recovered in the transmission link

An unknown glass has an index of refraction of n=1.5n=1.5. For a beam of light originating in the glass, at what angle is the light 100% reflected back into the glass? (The index of refraction of air is n air=1.00).

A step-index silica fiber with a core radius much longer than the operating wavelength of light has a core refractive index of 1.50 and a cladding refractive index of 1.48. Estimate the acceptance angle in the air

UNIT 2 AND 3

12 MARKS

Discuss the attenuation encountered in optical fiber communication due to Bending. Scattering and Absorption.

Discuss the construction and working of surface emitting and edge emitting LED.

With a neat sketch explain the principle and operation of PIN and Avalanche photodiode

Illustrate micro bending and macro bending losses with suitable diagram.

 Sketch the structure of LASER and explain its working principle.

LASER (Three key processes and radiation principle)

Intramodal and intermodal dispersion with relevant expression and diagrams

A 6km optical link consists of multimode step index fiber with a core refractive index of 1.5 and a relative refractive index of 1%. Estimate the delay difference between the slowest and fastest modes at the fiber output and the rms pulse broadening due to intermodal dispersion on the link. Also derive the expression involved in it .

Rayleigh Scattering with diagram

4 MARKS

Compare intramodal and intermodal dispersion

Explain about intrinsic absorption in optical fiber

Discuss about dispersion in optical fiber.

Differentiate between luminescence and incandescence

Comment on Quantum efficiency.

List out the types and advantages of photodiode.

Give the principle of photo detection in semiconductor.

What is the maximum core radius allowed for a glass fiber having n1-1.465 and n2-1.46 if the fiber is to support only one mode at wavelength of 1250m.

List the factors that cause Rayleigh scattering in optical fibers.

Compare fluorescence and phosphorescence

UNIT 4 AND UNIT 5

12 MARKS

construction and working of longitudinal electro-optic modulator

working principle and gain of Semiconductor optical amplifier (SOA).

working of Mach Zehnder Interferometers & applications

materials and processing techniques of OEIC

Discuss in detail the principle and operation of a photonic switch based on self-electro optic Device (SEED).

Explain in detail about Raman Nath (Transmission type) and Bragg modulator(Reflection type)

4 MARKS

Raman Nath Modulator.

Derivation of optical amplifier gain

longitudinal electro-optic modulator, transverse electro-optic modulator difference

front end Photo receivers

Monolithic and Hybrid Integration differences

Active couplers.

Kerr effect

Derive the expression for power, efficiency, and gain of erbium doped fiber amplifiers.

What is the need for integration of opto-electronic devices