Important Questions

Optical Communication
NEC -701

1. Draw a block diagram and explain the principle of Coherent detection method in optical fiber.
2. Briefly discuss the techniques of optical fiber preparation.
3. Differentiate between surface emitter LED and edge emitter LED.
4. Explain attenuation measurement techniques.
5. Explain the physical principle of APD. What is the temperature effect on Avalanche Gain? Describe Automatic Gain Control using Op-Amp.
6. Explain OTDR and also discuss optical power penalties.
7. Explain the working of a Heterodyne Detection technique suitable for optical fiber communication.
8. Write a short note on Dispersion Shifted Fiber (DSF).
9. Draw the block diagram of optical receiver. What are the various sources of noise in the receiver.
10. What are spontaneous emission and stimulated emission? Explain the principle of laser acton.
11. Describe the mechanism of intermodal dispersion in a multimode step index fiber. Show that the total broadening of a light pulse $\Delta T_s = \frac{L(NA)^2}{2n_1 c}$
12. Derive an expression for the coupling efficiency of a surface emitting LED into a step index fiber, assuming the device to have a Lambertian output.
13. Explain the working principal of LED. How the quantum efficiency of a LED is is defined? List out various parameters which are needed to be optimized for getting maximum output power from the LED.
14. Explain different types Optical fiber connectors: Joint Couplers and Isolators with suitable diagram.
15. With the aid of suitable diagram briefly discuss the following:
    1. Fiber bend losses
    2. Dispersion shifted fibers
16. What is the function of an optical detector? Draw an optical receiver configuration with different possible structures for front end amplifiers. Explain the different types of error/noise sources in an optical receiver.
17. Name the materials used for the fabrication of LEDs. Explain the working of LED and how its Efficiency can be defined? Discuss the Double Hetro-Juction LED.
18. Draw and explain the basic laser structure using optical feedback for producing laser oscillations/laser modes at resonant frequencies.
19. A 5 km length optical fiber link has a fiber cable which has attenuation of 4 dm km^{-1} and Connector losses at the source and detector are 4 and 3.5. Considering on the link, calculate the Total channel loss.

20. Draw optical power loss model for a point to point link and hence discuss link power budget And hence derive the total System rise time.

21. A continuous 12 km long optical fiber link has a loss of 1.5 dB/km.

    (i) What is the minimum optical power level that must be launched into the fiber to maintain an optical power level of 0.3μm at the receiving end?

    (ii) What is the required input power if the fiber has a loss of 2.5 dB/km^2.

22. A p-i-n photodiode has a quantum efficiency of 50% at a wavelength of 0.9μm. Calculate

    (i) Its resposivity at 0.9μm.

    (ii) The received optical power if the mean photocurrent is 10^{-6}A.

    (iii) The corresponding number of received photons at this wavelength.

23. Explain multichannel transmission techniques and hence describe the operational principle of WDM.

24. Explain the structure of Silicon Reach through Avalanche Photodiode (RAPD) with its gain mechanism.

25. What is mode coupling? Describe step Index Fiber with its refractive index profile and ray

26. Write short notes on

    i. WDM and its components

    ii. OTDR and Optical power meter

27. Describe the factor which limit the speed of response of photodiode and show the impact of change in temperature over the avalanche multification factors/ internal gain.

28. Define Graded index fiber. A multimode graded index exhibits the total pulse broadening of 0.1 μm over a distance of 15 km. Estimate (a) Maximum possible BW without ISI (b) pulse Dispersion per unit length (c) information carrying capacity.

29. Explain absorption loss mechanism with their causes in the silica glass fibers in details.

30. A Silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.50 and cladding refractive index of 1.47 Determine (a) the critical angle at the core- cladding interface (c) The acceptance angle in the air for the fiber.