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Reg. No. : .....

Name : .....



**Seventh Semester B.Tech. Degree Examination, May 2013**
**(2008 Scheme)**
**08.702: OPTICAL COMMUNICATION (T)**

Time : 3 Hours Max. Marks : 100

***Instructions :*** *1) Answer **all** questions in Part – **A**. **Each** question carries 4 marks.*
*2) Answer **any two** questions from **each** Module in Part – **B**. **Each** question carries **10** marks.*

PART – A

1. List three major causes of dispersion in an optical fiber and explain.
2. What are the factors which limit fiber bandwidth ?
3. Compare LEDs and Laser Diodes as optical sources.
4. Estimate the critical radius of curvature at which bending losses occur in a step index multimode fiber with a core refractive index of 1.500, a relative refractive index difference of 3% and an operating wavelength of 0.82 μm.
5. What are the typical applications of EDFAs ?
6. An APD with a multiplication factor of 20, operates at a wavelength of 1.5 μm. Calculate the quantum efficiency and the output photo current from the device if its responsivity at this wavelength is 0.6 $AW^{-1}$ and $10^{10}$ photons of wavelength 1.5 μm are incident upon it per second.
7. What are solitons ? How do they retain their shape with respect to dispersion ?
8. What are the sources of noise in LASER diodes ?
9. How many modes can support a step index fiber with d = 8.3 μm, refractive index of core = 1.4513 and refractive index of cladding = 1.4468 and $\lambda$ = 1550 nm.
10. What is the ideal wavelength of operation of an optical amplifier ? Why ?

**(10×4=40 Marks)**

P.T.O.

## PART – B

### Module – I

11. Explain the different fiber fabrication processes.

12. a) Distinguish between surface emitted and edge emitter LEDs with neat sketches.

    b) When the mean optical power launched into an 8 km length of fiber is 120 μW, the mean optical power at the fiber output is 3 μW. Determine the overall signal attenuation or loss in decibels through the fiber assuming there are no connectors or splices. Also estimate the signal attenuation per kilometer for the fiber.

13. Explain the working principle of Fabry Perot LASER Diode. **(10×2=20 Marks)**

### Module – II

14. a) What are the wavelengths used for pumping EDFAs and explain how the pump ESA reduces the amplitude efficiency ?

    b) An optical fiber link consists of multimode step index fiber which has a numerical aperture of 0.2 and a core refractive index of 1.5. The Rayleigh scattering coefficient for the fiber is 0.7/km. When light pulses of 50 ns duration are launched into the fiber, calculate the ratio in decibels of the backscattered optical power to the forward optical power at the fiber input. The velocity of light in vacuum is $2.998 \times 10^8$ m/s.

15. Discuss, with the aid of a block diagram, the function of major elements of an optical fiber receiver. In addition, describe the possible techniques for automatic gain control in APD receivers.

16. a) Explain the working of ASK Heterodyne system and derive an expression for bit error rate.

    b) Calculate the number of received photons per bit in order to maintain a BER of $10^{-9}$ for ASK heterodyne synchronous detection. **(10×2=20 Marks)**

## Module – III

17. Discuss the various system design constraints in soliton light wave communication systems.

18. Draw the structure of soliton link and derive an expression for bit error rate.

19. Discuss the importance of Add/drop multiplexers and wavelength tunable sources in WDM. **(10×2=20 Marks)**