Seventh Semester B. Tech. Degree Examination

(2013 Scheme)

13.702: OPTICAL COMMUNICATION (T)

Time: 3 Hours Max.Marks: 100

PART – A

Answer all questions. Each carries 2 marks $(10 \times 2 = 20\ Marks)$

1. What is meant by Numerical Aperture? Give its equation.
2. Define V-Number. What is its importance?
3. What are the 3 optical windows? Plot the attenuation characteristics of the windows.
4. What is meant by amplitude spontaneous emission (ASE)?
5. What are the advantages of semi conductor optical amplifiers?
6. What is GH effect?
7. What are add drop multiplexers?
8. Determine the critical angle at the core cladding interface for a fiber with n1=1.5 and n2=1.47.
9. Compare coherent receivers with IMDD systems
10. Estimate the critical radius of curvature at which large bending losses occur for a multimode fiber with core refractive index of 1.5, a relative refractive index difference of 3% and operating wavelength of 0.82μm.

PART – B

Answer any one question from each module. Each question carries 20 Marks

Module - I

11. What is meant by dispersion? Explain the different types.

12. (a) Explain briefly about (i) Photonic bandgap fibers
(ii) Index guiding fibers (12 marks)

(b) A graded index fiber with a parabolic refractive index profile core has a refractive index at the core axis of 1.5 and a relative index difference of 1%. Estimate the maximum possible core diameter which allows single mode operation at a wavelength of 13micro meter. (8 marks))

Module – II

13. (a) Explain the principle and working of PIN and APD. Compare their performance. (15 marks)

(b) When 3×10^{11} photons with a wavelength of 0.85μm are incident on a photodiode on average 1.2×10^{11} electrons are collected at the terminals of the device. Determine the quantum efficiency and responsivity of the photodiode at 0.85μm (5 marks)

14. What are the different laser diode structures? Explain the major advantages of Laser diode over LED as optical source.(20 marks)

Module – III

15. What are optical amplifiers? Explain the different types. Explain the principle and working of EDFA and their different architectures .(20 marks)

16. (a) Explain the working and principle of OTDR and how fault detection and refractive index measurements are done using this. (15 marks)

(b)A semiconductor optical amplifier operating at a signal wavelength of1.3μm produces a gain of 20dB with an optical bandwidth of 900GHz.The device has a spontaneous emission factor of 1.5 and the mode number is equal to 2 with a net signal gain of 300.
Determine
a) The length of the SOA
b)The ASE noise signal power at the output of the amplifier (5 marks)

Module – IV

17. (a) Explain briefly about the different types of gratings and tunable filters used in WDM (10 marks)

(b)Explain the working of MZ interferometer (10 marks)

18. (a)Define the terms amplifier spacing and dispersion length. Briefly discuss why these both must be considered in order to achieve high transmission rates in an optical fiber soliton system. (10 marks)

(b) Discuss the major issues in soliton transmission using lumped EDFA repeater. (10 marks)