

M.TECH DEGREE EXAMINATION
Model Question paper
Branch: Electronics and Communication Engineering
Specialization: Advanced Communication and Information Systems
First Semester
MECCI 104 ADVANCED OPTICAL COMMUNICATION SYSTEMS
(Regular – 2013 Admission Onwards)

Answer all Questions .All questions carry equal marks

Time 3hrs

Max Marks:100

1. a) Differentiate between step index and graded index fiber (5)
b) Explain different types of fiber losses (8)
c) Explain dispersions in single mod fiber in detail (12)

OR

2. a) Define bandwidth and rise time of photo detectors (5)
b) Explain optical receiver sensitivity (8)
c) Consider a 0.8 μ m receiver with a silicon p-i-n photodiode. Assume 20MHz bandwidth, 65% quantum efficiency, 1nA dark current, 8pF junction capacitance, and 3dB amplifier noise figure. The receiver is illuminated with 5 μ W optical power. Determine the RMS noise current due to shot noise, thermal noise, and amplifier noise. Also calculate the SNR (12)
3. a) What are the different types of light wave system architecture? (5)
b) Explain about power budget and rise time budget (8)
c) A 1.3- μ m long haul light wave system is designed to operate a 1.5Gbps. It is capable of coupling 1 mW of average power into the fiber. The 0.5-dB/km fiber cable loss includes splice losses. The connectors at each end have 1dB losses. The InGaAs p-i-n receiver has a sensitivity of 250 nW. Make the power budget and estimate the repeater spacing (12)

OR

4. a) A distribution network uses an optical bus to distribute the signal to 10 users. Each optical tap couples 10% of the power to the user and has 1-dB insertion loss. Assuming that the station 1 transmits 1mW of power over the optical bus. Calculate the power received by the stations 8,9, and 10. (5)
b) What are the design guidelines associated with lightwave systems? (8)
c) Explain Long-Haul systems? (12)
5. a) Explain optical amplifier spectrum and bandwidth (5)
b) Explain principle and characteristics of Raman amplifier (8)
c) Explain EDFA (12)

OR

6. a) What are the needs for dispersion management (5)
b) What is pre-compensation technique? Explain any Two techniques (8)
c) What is the dispersion-limited transmission distance for 1.55- μ m lightwave system (12)

making use of direct modulation at 10Gbps? Assume that frequency chirping broadens the Gaussian-shape pulse spectrum by a factor of 6 from its transform-limited width.

Use $D=17 \text{ ps}/(\text{km}\cdot\text{nm})$ for fiber dispersion? How much improvement in the dispersion-limited transmission distance is expected if an external modulator is used in place of direct modulator?

7. a) Give the mathematical description of soliton employing non linearschrodinger equation. (5)
- b) Explain white and dark solitons (8)
- c) Explain soliton based communication systems (12)
- OR
8. a) Briefly explain about dispersion decreasing fiber (5)
- b) How timing jitter is controlled in optical amplifier? (8)
- c) What are the different types of timing jitter in high speed soliton communication? (12)