

Registration no:

Total Number of Pages: 01

M.TECH
ETPE204

Second Semester Examination 2013

OPTICAL COMMUNICATION

Time: 3 Hours

Max marks: 70

Answer Question No.1 which is compulsory and any five from the rest.

The figures in the right hand margin indicate marks.

- Q1 Answer the following questions: (2 x 10)
- What do you mean by total internal reflection? If the refractive indexes of the core and cladding of a silica fiber are 1.48 and 1.46 respectively, then what is the critical propagation angle?
 - List the advantages of fiber-optic communication over other types of communication techniques.
 - If the energy band gap of an LED is 2.5 eV, then what color will it radiate?
 - Calculate the number of modes for a graded index optical fiber, if its core diameter is $62.5 \mu\text{m}$, its NA is 0.275 and its operating wave length is 1300 nm.
 - What are the differences between TE, TM and HE modes?
 - Differentiate between direct band gap and indirect band gap semiconductors. Which type of semiconductors is used for manufacturing of LASER?
 - What do you mean by dark current? Which biasing is used to eliminate the dark current?
 - What do you mean by wavelength reuse?
 - What do you mean by optical amplifiers? Give example of any two.
 - What power is radiated by an LED if its quantum efficiency is 1% and the peak wavelength is 850 nm?
- Q2 a) What do you mean by FDDI? In the FDDI, some fields have fixed length, others variable lengths. Why is that? (4)
- b) With proper diagram, explain the signal degradation mechanisms, in case of an optical fiber. (6)
- Q3 a) Deduce the expression for power carried by the cladding of a graded index optical fiber. A graded index fiber has $NA = 0.200$, $d_{\text{core}} = 50 \mu\text{m}$ and $\lambda = 1300 \text{ nm}$. What power is carried by its cladding? (5)
- b) Briefly explain the mechanism of Intra modal dispersion. How is it different from inter modal dispersion? (5)
- Q4 a) Deduce the expression for Internal and External Quantum Efficiency of a LASER diode. (5)
- b) Explain Link Power Budgeting. (5)
- Q5 What are the characteristics of LASER diode? How is it different from LED? State the LASER diode threshold conditions and there by derive the rate equations and expression for the frequency and wavelength spacing. (10)
- Q6 a) Derive the expression for the probability of error, P_e for an optical receiver. (6)
- b) With suitable justification differentiate between OOK Homodyne and PSK homodyne systems. (4)
- Q7 a) With neat diagram explain the homodyne and heterodyne detection schemes. (5)
- b) With proper diagram, explain the concept of photonic switching. (5)
- Q8 Write short notes on any two (5 x 2)
- WDM
 - Modified Chemical-vapor Deposition Process
 - Avalanche Photo Diode
 - Eye Diagram