2023
M. E. (Information Technology)
First Semester
MEIT-1102: Advanced Optical Communications

Time allowed: 3 Hours                                             Max. Marks: 50

**NOTE**: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.*

x-x-x

I.   Attempt the following:-

(a) Discuss any two advantages of fibre optic communication?

(b) Name three Optical Transmission Windows?

(c) What are the various types of Chromatic Dispersion?

(d) Out of Laser and LED as Optical sources, which one is better & why?

(e) Discuss the term Optical Ethernet.                                  (5x2)

## UNIT - I

II.  a) Discuss mathematically the concept of phase shift with total internal reflection and the evanescent field in the electromagnetic mode theory for optical propagation?

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 $1.3\mu m$.                                  (6,4)

III. a) Describe various types of scattering losses that impact the fiber attenuation spectra? Derive the mathematical formula for the material dispersion parameter M?

b) Explain the concept of Polarization and Fiber birefringence? Two polarization maintaining fibers operating at awavelength of $1.3\mu m$ have beat lengths of 0.7mm and 80m. Determine the fiber birefringence in each ease and comment on the results.                                  (6,4)

IV.  a) Explain with the help of diagram, the structure of basic cylindrical ferrule connector? Is it better than multiple fiber connector?

b) Explain with the help of Energy Level diagrams the Population Inversion and Easing for two non semiconductor lasers? What is the threshold condition for Laser Oscillation?

c) Draw and explain the Schematic structure of Double Heterojunction AlGaAs edge emitting LED?                                  (3,3,4)

## UNIT - II

V.  a) Explain the significance of Optical Detection Principle? Discuss the performance comparison in terms of Responsivity against wavelength characteristics for an ideal silicon photodiode and for Si, Ge and InGaAs photodiode with different quantum efficiencies?

b) Discuss the Gain-bandwidth characteristics of different optical amplifiers?

c) Draw the various amplifier configurations for providing wideband amplification?

(4,3,3)

VI.  a) Explain how Automatic Gain Control & Equalization are achievable in case of Optical receiver circuit using typical operational amplifier?

b) Describe the system design considerations for using repeaters in long haul optical fiber communication system?

c) Discuss the significance of optical fiber soliton transmission system?

(4,3,3)

VII.  Write short notes on the following:-

(a) Practical constraints of Coherent transmission

(b) Differential Phase Shift Keying

(c) Wavelength switching network architecture

(d) Optical Network protection and Survivability

(4x2½)

x-x-x