18TE71

# Seventh Semester B.E. Degree Examination, Feb./Mar. 2022 Optical Communication

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

#### Module-1

- a. Discuss the advantages/disadvantages of optical fiber communication. (06 Marks)
  - Derive the equations of Numerical Aperture considering the ray path for meridonial ray in optical fiber communication. (98 Marks)
  - c. A relative refractive index difference for an optical fiber is 1%. Estimate the numerical aperture and solid acceptance angle in air for the fiber when the core index is 1.46. Calculate the critical angle at the interface. (96 Marks)

#### OR

- Discuss photonic crystal fibers and explain index guided microstructures and photonic bandgap fibers with suitable diagrams. (68 Marks)
  - With neat schematic, explain refractive index profile and ray transmission in multi-mode step index and graded index.
  - c. Determine the cut off wavelength for a step index fiber for single mode operation when the core refractive index and radius are 1.46 and 4.5 µm, with relative index difference being 0.25%.
    (84 Marks)

#### Module-2

- a. Explain the linear and Non-Linear scattering losses with suitable equations. (10 Marks)
  - A 6km optical link consists of multimode step index fiber with core refractive index of 1.5 and relative refractive index difference of 1%. Estimate:
    - The delay difference between the slowest and firstest modes at fiber output.
    - ii) The rms pulse broadening due to intermodal dispersion on link.
    - iii) The maximum bit rate.
    - (v) The Bandwidth-Length product.

(10 Minerkey)

#### OR

- a. Discuss the Fusior and Mechanical liber splices. (08 Marks)
  - Explain the significance of fiber connectors and with schematics, discuss cylindrical ferrule connectors. (06 Marks)
  - c. A graded index fiver has a parabolic refractive index profile (α = 2) and core diameter of 50μm. Estimate the insertion loss due to 3μm lateral misalignment at fiber joint when there is index matching and assuming.
    - There is uniform illumination of all guided modes only.
    - There is uniform illumination of all guided and leaky modes.

606 Minutley):

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Selected Papers on Fiber Optic Communications Lynn D. Hutcheson, Stephen C. Mettler, 1993 SPIE Milestones are collections of seminal papers from the world literature covering important discoveries and developments in optics and photonics

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