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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech VI Semester End Examinations (Regular) - May, 2019

Regulation: IARE – R16

OPTICAL COMMUNICATION

Time: 3 Hours

(ECE)

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

- (a) Draw a block diagram of fiber optic communication system and describe the function of each component. [7M]

(b) Consider a graded –index fiber with a parabolic refractive index profile which has a core diameter of 50 μ m. The fiber has numerical aperture of 0.2. Estimate the total number of guided modes propagating in the fiber when it is operating at a wavelength of 1 μ m. [7M]
- (a) Write short notes on ray optics theory. Deduce the expressions for ray theory transmission and make use of it to obtain Numerical Aperture. [7M]

(b) A light wave is travelling in a semiconductor medium (GaAs) of refractive index 3.6. It is incident on a different semiconductor medium (AlGaAs) of refractive index 3.4 and the angle of incidence is 80°. Conclude whether this can result in Total Internal Reflection. [7M]

UNIT – II

- (a) Deduce an expression for pulse spreading due to material dispersion which is a function of wavelength and time delay. [7M]

(b) When the optical power launched into an 8 Km length of fiber is 120mW, the mean optical power at the fiber output is 3W. Determine [7M]

 - The overall signal attenuation in dB.
 - The signal attenuation per kilometer for the fiber.
- (a) Discuss about the absorption and bending loss. Summarize the principle of operation and working of LED diode. [7M]

(b) An LED has radiative and nonradiative recombination times of 30ns and 100ns respectively. Determine the internal quantum efficiency. [7M]

UNIT – III

- (a) Explain about sub carrier multiplexing with suitable examples. [7M]

(b) The radiative and nonradiative recombination lifetimes of the minority carriers in the active region of a double hetero junction LED are 60ns and 100ns respectively. Determine the total carrier recombination life time and the power internally generated within the device when the peak emission wavelength is 0.87 μ m at a drive current of 4mA. [7M]

6. (a) Outline about various multichannel transmission techniques. Discuss about the various wavelength division multiplexing (WDM) components. [7M]
- (b) Ga As has band gap energy of 1.43eV at 300K. Determine the wavelength above which an intrinsic photo detector fabricated from this material will cease to operate. [7M]

UNIT – IV

7. (a) Write short notes on Raman amplifiers. Explain about spontaneous and stimulated emission in amplifiers. [7M]
- (b) Calculate the number of independent signals that can be sent on a single fiber in the 1525-1565 nm bands. Assume the spectral spacing as per ITU-T recommendation G.692. [7M]
8. (a) Discuss about the principle of operation and construction of semiconductor amplifier. Evaluate about the saturation induced crosstalk and amplifier noise in optical amplifiers [7M]
- (b) What is attenuation and what are its units. Why the attenuation limit curve slopes towards to the right? [7M]

UNIT – V

9. (a) What are the features and implementation of WDM? Write a short note on fiber soliton. [7M]
- (b) Draw the frame format of SONET, what are the basic performance criteria of WDM technique? [7M]
10. (a) What are the main parameters used for characterizing the performance of optical amplifiers in a communication system? [7M]
- (b) Explain the principle of solitons and discuss the soliton parameters with necessary expressions and diagrams. [7M]

