

B.Tech IV Year I Semester (R13) Supplementary Examinations June 2017

OPTICAL FIBER COMMUNICATION

(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 70

PART – A
(Compulsory Question)

1 Answer the following: (10 X 02 = 20 Marks)

- (a) A multimode silica fiber that has a core refractive index $n_1 = 1.48$ and cladding index $n_2 = 1.48$. Compute the numerical aperture.
- (b) A light ray is incident from glass to air. Calculate the critical angle $[\theta_c]$.
- (c) State any two differences between step index fiber and graded index fiber.
- (d) What is chromatic dispersion?
- (e) State the advantages of LEDs.
- (f) On an InGaAs photo detector a pulse of 85 nsec emits 6×10^6 photons at 1300 nm wavelength. Average e-h pairs generated are 5.4×10^6 . Calculate the quantum efficiency of detector.
- (g) State the types of lensing schemes for coupling improvement.
- (h) What is fiber splicing?
- (i) A digital fiber link operating at 850 nm requires a BER of 10^{-9} . Calculate quantum limit in terms of quantum efficiency.
- (j) What is link power budget?

PART – B
(Answer all five units, 5 X 10 = 50 Marks)**UNIT – I**

2 State and explain the advantages and disadvantages of fiber optic communication systems.

OR

3 What is numerical aperture? Derive an expression for numerical aperture and maximum acceptance angle in case of a step index optical fiber in terms of refractive index core and cladding material.

UNIT – II

4 Discuss the following for optical fibers:

- (a) Material dispersion.
- (b) Bending loss.

OR

5 Explain in detail the design optimization of single mode fibers.

UNIT – III

6 Explain the structure of surface emitting and edge emitting LEDs.

OR

7 Explain with the diagrams, the different lensing schemes used to improve source to fiber coupling efficiency.

UNIT – IV

8 Explain the following terms relating to PIN photodiode with proper expressions:

- (a) Cut-off wavelength.
- (b) Quantum efficiency.

OR

9 With a schematic diagram, explain the working of optical receiver.

UNIT – V

10 Explain the following:

- (a) Carrier to noise ratio.
- (b) Inter modulation distortion.

OR

11 What is rise time budget? With necessary expressions explain its significance.