Roll No. | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Electronics & Communication Engineering) (Sem.–6)

OPTICAL FIBERS & COMMUNICATION

Subject Code : BTEC-602-18

M.Code : 79375

Date of Examination : 18-07-22

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) How BER is related to the quality of the signal?

b) What do mean by wavelength converter? Explain FWM wavelength converter.

c) Calculate the quantum efficiency at 1300 nm if the change in power of 2mW produces a current change of 6mA.

d) Define the receiver sensitivity.

e) List the advantages of optical communication.

f) Suppose you use an LED whose energy gap equals 2.5 eV. What wavelength signal will it radiate?

g) Differentiate between Splices and Connectors.

h) Calculate chromatic dispersion in single mode fibre at the 1550 nm operating wavelength with $\Delta\lambda$=1 and L=1 km.

i) Calculate the length of DCF having dispersion coefficient of -46 ps/km, if length of SMF is 40 km with dispersion coefficient of 18.75 ps/km.

j) What is Chromatic dispersion?

SECTION-B

2. What is linear scattering? Briefly explain the Rayleigh scattering and Mie scattering with relation to intrinsic and extrinsic absorption mechanism.

3. When the mean optical power launched into an 10 Km length of fiber is 180 μW, the mean power at the other end of the fibre is 10 μW. Determine the overall signed attenuation in dB through the fiber assuming there are no connectors or splices and also, the overall signal attenuation for 10 Km optical link using same fibre with splices at 1Km interval, each giving an attenuation of 1 dB.

4. A silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.50 and cladding refractive index of 1.47. Determine: (i) the critical angle at core cladding interface, (ii) the numerical aperture for the fiber, and (iii) the acceptance angle in air for the fiber.

   Why is stimulated emission used in laser? Give the fundamental structure of optical confining?

5. Derive the expression for calculating the power budget.

6. Starting from Maxwell's equation, derive the expression for wave equation, derive the expression for wave propagating through optical fiber.

SECTION-C

7. Discuss the sources of errors in optical receivers with mathematical expressions.

8. (a) Describe the add/drop techniques in WDM optical networks.

   (b) Compare the quantum efficiency of PIN & APD photo-detectors.

9. A 6 Km optical link consists of multimode step index fiber with a core refractive index of 1.5 and a relative refractive difference of 1%. Estimate:

   i. The delay difference between the slowest and fastest modes at fiber output.

   ii. The rms pulse broadening due to intermodal dispersion on the link.

   iii. The maximum bit rate that may be obtained without substantial error on the link assuming only intermodal dispersion.

   iv. The bandwidth-length product corresponding to (iii).

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.