Reg. No. : | | | | | | | | | | | | |

Question Paper Code : X 20460

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Seventh Semester
Electronics and Communication Engineering
EC 6702 – OPTICAL COMMUNICATION AND NETWORKS
(Regulations 2013)
(Common to PTEC 6702 – Optical Communication and Networks for B.E. (Part-Time) – Sixth Semester – Electronics and Communication Engineering)
(Regulations – 2014)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. List the advantages of optical fibers.

2. A certain single mode step-index fiber has a mode field diameter of 11.2 μm and V = 2.25. What is the core diameter of this fiber ?

3. Draw a graph on how the attenuation varies over wavelength for a standard single mode fiber.

4. A given step index fiber has a core refractive index of 1.480, a core radius equal to 4.5 μm and a core-cladding index difference of 0.25 percent. What is the cutoff wavelength ?

5. Depict the electron recombination and the associated photon emission for direct-bandgap and indirect-bandgap materials.

6. Define internal quantum efficiency and bulk recombination lifetime of LED.

7. What is cutback technique in attenuation measurements ?

8. Define Bit error rate. What is the typical error rates ranges between for optical fiber telecommunication systems ?

9. Write the expressions for blocking probability and achievable utilization for a given blocking probability in a network with wavelength conversion and without wavelength conversion.

10. Define Optical CDMA.

PART – B **(5×13=65 Marks)**

11. a) i) Discuss about various key elements of optical fiber systems. **(5)**

ii) Explain in detail about total internal reflection, acceptance angle and numerical aperture with necessary diagrams and derivations. **(8)**

(OR)

b) i) Write briefly with neat diagrams on linearly polarized modes in optical fiber. **(8)**

ii) Give a short notes on graded index fiber structure. **(5)**

12. a) Explain how the signal is distorted by microscopic variation in material density, macro bending and micro bending. **(13)**

(OR)

b) Define dispersion in optical fibers and explain types of dispersion such as material dispersion, waveguide dispersion and polarization mode dispersion. **(13)**

13. a) Elaborate the working of Laser diodes along with laser modes and threshold conditions and external quantum efficiency. **(13)**

(OR)

b) Elaborate the impact of mechanical misalignment, fiber-related losses and fiber end-face preparation in fiber-to-fiber joints of fiber optic system. **(13)**

14. a) Illustrate the fundamental optical receiver operation and its error sources. **(13)**

(OR)

b) With necessary diagrams and equations write short notes on

i) Time-domain intermodal dispersion measurement. **(7)**

ii) Frequency domain international dispersion. **(6)**

15. a) Explain about SONET/SDH transmission formats and speed, SONET/SDH rings and SONET/SDH Networks. **(13)**

(OR)

b) Discuss about a special kind of wave that can propagate undistorted over long distance and remain unaffected after collision with each other. **(13)**

PART – C **(1×15=15 Marks)**

16. a) Analyze the impact of a third nonlinearity four wave mixing in the signal propagating through the optical fiber. How the FWM can be mitigated ? And also discuss about how four wave mixing can be used for wavelength conversion. **(15)**

(OR)

b) i) Consider an EDFA being pumped at 980 nm with 30 mW pump power. If the gain at 1550 nm is 20 dB, what are the maximum input and output powers ? **(6)**

ii) Draw absorption and gain spectra for erbium ions in silica fiber doped with Ge and A1. **(3)**

iii) List 3 points that note from the curves given in the below figures a and b. **(6)**

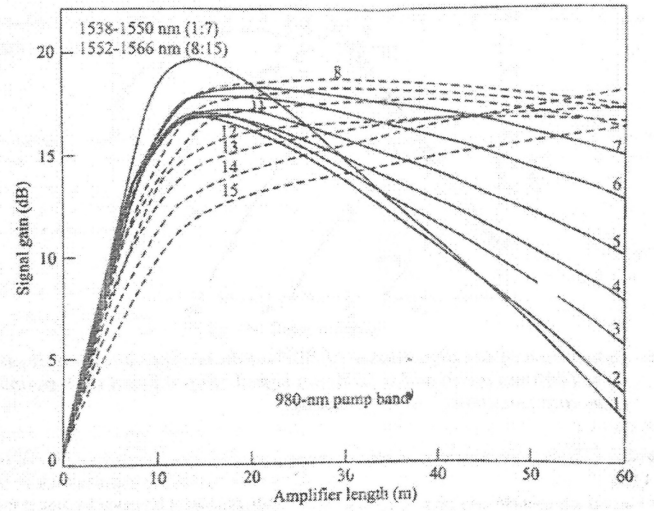

Figure a) : EDFA gain versus amplifier length for 15 WDM signals that are co-directionally pumped with 50 mW of 980 nm pump power.

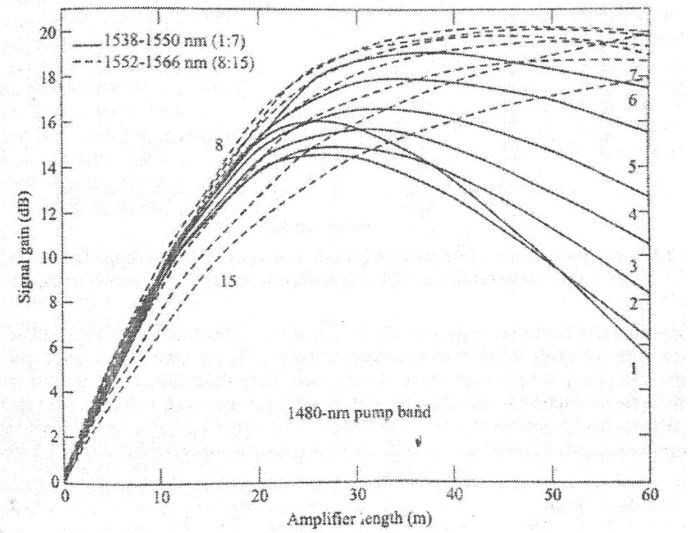

Figure b) : EDFA gain versus amplifer length for 15 WDM signals that are co-directionally pumped with 50 mW of 1480 nm pump power.