

ONE TIME EXIT SCHEME

USN

--	--	--	--	--	--	--	--	--	--

10EC/TE72

Seventh Semester B.E. Degree Examination, April 2018 Optical Fiber Communication

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.

PART – A

1. a. What are the advantages and applications of optical fiber communication? (06 Marks)
b. With suitable diagrams, give comparison of conventional single-mode and multimode step index and grading index optical fibers. (08 Marks)
c. With neat diagram explain the structure of a six fiber cable created by standing six basic fiber building blocks around a central strength member. (06 Marks)
2. a. Explain the macrobending loss and microbending loss with relevant diagrams. (08 Marks)
b. Explain material dispersion and waveguide dispersion with derivation and relevant graph. (08 Marks)
c. For a single mode fiber $n_2 = 1.48$ and $\Delta = 0.2\%$ operating at $\lambda = 1320$ nm. Compute the waveguide dispersion if $V \cdot \frac{d^2(V_b)}{dV^2} = 0.26$ (04 Marks)
3. a. Explain the structure of LED with cross-sectional drawing of a GaAlAs double-hetero structure light emitter, energy band diagram and variations in the refractive index. (08 Marks)
b. Give comparison between LED and Laser diode. (04 Marks)
c. Explain the operation of the Avalanche photodiode with schematic diagram and variation of E-field across diode. (05 Marks)
d. Photons having energy 1.53×10^{-19} Joules are incident on a photodiode having responsivity of 0.65 A/W. If output power is 10 μ W. Find the generated photocurrent. (03 Marks)
4. a. With relevant diagrams explain the possible lensing schemes used to improve optical source to fiber coupling efficiency. (06 Marks)
b. Explain the operation of the V-groove optical fiber splicing technique and fusion splicing of optical fibers with relevant diagrams. (08 Marks)
c. Explain the structure of the two alignment schemes used in fiber-optic connectors (i) straight sleeve and (ii) tapered sleeve with diagrams. (06 Marks)

PART – B

5. a. Explain the operation of the basic sections of an optical receiver with relevant block diagram. (06 Marks)
b. Explain the following terms briefly :
(i) Receiver sensitivity
(ii) Quantum limit (06 Marks)
c. Explain the 'Eye Pattern Features' with (i) General configuration of an eye-diagram showing the definitions of fundamental measurement parameters (ii) Simplified eye-diagram showing the key performance parameters. (08 Marks)

- 6 a. Explain the operation of the multichannel Amplitude modulation technique with suitable diagram. (07 Marks)
- b. Explain the principle of operation of the Radio-over-fiber concept of a broadband access network for interconnecting antenna base stations with the central controlling office. (07 Marks)
- c. Design an optical fiber link for transmitting 15 Mb/sec of data for a distance of 4 kms with BER of 10^{-9} . (06 Marks)
- 7 a. Explain the principle of operation of the wavelength division multiplexing system containing various types of optical amplifiers. (07 Marks)
- b. Explain the design and operation of a polarization independent isolator made of three miniature optical components. (07 Marks)
- c. With suitable schematic diagram explain the principle of operation of the adding and dropping wavelengths with a 4×4 OADM device that uses miniature switching mirrors. (06 Marks)
- 8 a. Explain the basic operation of a generic optical amplifier, with couplers. (05 Marks)
- b. With relevant diagrams explain the principle of operation of the SONET/SDH rings. (09 Marks)
- c. Explain the importance of the High speed lightwave links. Also explain about links operating at 10 Gb/s. (06 Marks)

* * * * *