

# CBCS SCHEME

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15EC82

**Eighth Semester B.E. Degree Examination, Aug./Sept.2020**

## Fiber Optics and Networks

Time: 3 hrs.

Max. Marks: 80

- Note: i) For Regular Students: Answer any FIVE full questions irrespective of modules.  
ii) For Arrear Students : Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Explain Optical Fiber transmission link with suitable block diagram. (06 Marks)  
b. Discuss classification of Optical Fiber depending on Refractive Index profile, mode of operation and material used. (06 Marks)  
c. Find Numerical aperture and number of propagation modes for a step index fiber with indices 1.5 and 1.48 with core radius 25  $\mu\text{m}$ . If the wavelength of the optical signal propagating in the fiber is 1300 nm. (04 Marks)
- 2 a. What are the different types of materials used for fabrication of optical fiber and their requirements? (06 Marks)  
b. Explain Index-guiding photonic crystal fiber with suitable diagram. (04 Marks)  
c. Discuss Ray Theory model for multimode step index and graded index fiber. (06 Marks)

### Module-2

- 3 a. Explain the different mechanism caused by absorption loss. (05 Marks)  
b. The Input power to an optical fiber is 2 mw while the power measured at the output end is 2  $\mu\text{w}$ . If the fiber attenuation is 0.5 db/km, calculate the length of the fiber. (05 Marks)  
c. What are the different types of bending losses in fiber and explain with suitable diagram. (06 Marks)
- 4 a. Explain the different types of mechanical misalignment between two fibers. (05 Marks)  
b. What are the different types of splicing and explain V-groove optical fiber splicing technique. (05 Marks)  
c. What are the principles of good connector design. (06 Marks)

### Module-3

- 5 a. Explain Electron recombination and the associated photon emission for Direct and Indirect bandgap materials. (06 Marks)  
b. With schematic explain high-radiance surface emitting LED. (06 Marks)  
c. A double-heterojunction InGaAsP LED emitting at a peak wavelength of 1310 nm has radiative and non-radiative recombination time of 30 ns and 100 ns respectively. The drive current is 40 mA calculate internal efficiency and optical power generated internally to the LED. Assume  $h = 6.6256 \times 10^{-34}$  J-s ;  $Q = 1.602 \times 10^{-9}$  C. (04 Marks)

OR

- 6 a. Explain the three key transition process involved in laser action. (04 Marks)  
b. Explain Reach-Through avalanche photodiode with neat diagram. (06 Marks)  
c. With schematic explain reverse biased pin photodiode. (06 Marks)



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**Module-4**

- 7 a. Explain the implementation of WDM networks with various types of optical amplifiers. (06 Marks)  
b. With layout explain 2×2 Mach-Zehnder Interferometer. (04 Marks)  
c. Explain Design and operation of a Polarization-Independent Isolator. (06 Marks)
- 8 a. Explain MEMS actuation method with neat diagram. (04 Marks)  
b. Explain 4×4 OADM with miniature switching mirrors. (06 Marks)  
c. Explain the Basic operation of a generic optical amplifier. (06 Marks)

**Module-5**

- 9 a. Explain IPV6 packet with extension header. (06 Marks)  
b. Explain ATM Protocol Architecture. (04 Marks)  
c. Explain the Basic operation of long-haul circuit switching Telecommunication Networks. (06 Marks)
- 10 a. Explain Optical-cross connect architecture using optical space switches. (08 Marks)  
b. Explain Generic Structure of an optical burst switching networks. (08 Marks)

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