

# CBCS SCHEME

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21EC72

## Seventh Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025 Optical and Wireless Communication

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Briefly explain with a neat figure the propagation mechanism of meridional rays in an ideal step index optical waveguide. (08 Marks)
- b. Define the term attenuation in optical fibers. Explain the different attenuation mechanisms in optical fibers. (12 Marks)

OR

- 2 a. Define Dispersion. Briefly explain intermodal and intramodal dispersion effects in optical waveguide. (10 Marks)
- b. With neat figures, discuss the structure of single mode and multimode step-index and graded index optical fibers. (06 Marks)
- c. A multimode fiber has a core refractive index of 1.480 and a core cladding index difference of 2.0 percent. Find the numerical aperture and critical angle at the core cladding interface. (04 Marks)

### Module-2

- 3 a. What are the characteristic requirements of an optical source? With the help of neat diagram, explain the constructional features and emission pattern of surface emitting LED. (10 Marks)
- b. Define optical isolator. With a neat figure, explain the design and operation of a polarization independent isolator. (06 Marks)
- c. A given silicon avalanche photodiode has a quantum efficiency of 65 percent at a wavelength of 900 nm. If  $0.5 \mu\text{W}$  of optical power produces a multiplied photocurrent of  $10 \mu\text{A}$ . What is the multiplication  $M$ ? (04 Marks)

OR

- 4 a. Discuss the operation of pin photodiode with a neat circuit and energy band diagram. (10 Marks)
- b. What is Diffraction gratings? Discuss briefly Diffraction grating techniques. (10 Marks)

### Module-3

- 5 a. Explain briefly the different propagation mechanisms that influence the signal propagation in a mobile communication environment. (10 Marks)
- b. A cellular communication service area is covered with 12 clusters having 7 cells in each cluster and 16 channels assigned in each cell. Find the number of channels per cluster and the system capacity. (03 Marks)
- c. Explain how the concept of frequency reuse increases the spectrum efficiency that in turn increases the cellular communication system capacity. (07 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg,  $42+8=50$ , will be treated as malpractice.

OR

- 6 a. Briefly discuss the generations of wireless communication network technology. (08 Marks)  
b. Discuss the effects of co-channel interference in wireless communication in reducing the system capacity. (05 Marks)  
c. Discuss the concept of multipath fading in mobile communication system. (07 Marks)

**Module-4**

- 7 a. With a neat block diagram, explain the operation of basic TDMA link. (10 Marks)  
b. Explain the basic cellular system with necessary block diagram. (10 Marks)

OR

- 8 a. Discuss with a neat figure the call processing in a cellular system for mobile-originated calls. (12 Marks)  
b. List the advantages of CDMA over TDMA and FDMA. (08 Marks)

**Module-5**

- 9 a. What is Hand off in GSM networks? Explain briefly the different handoff procedure in GSM. (10 Marks)  
b. Explain the functions of data bases HLR and VLR at MSC in GSM network architecture and also explain how it is helpful in location updation in GSM networks. (10 Marks)

OR

- 10 a. Briefly explain the three major subsystems in GSM network architecture with a neat block diagram. (10 Marks)  
b. Explain briefly the following identifiers in GSM system:  
(i) SIM  
(ii) Mobile system ISDN with frame format  
(iii) Location Area Identify (10 Marks)

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