



**Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026**  
**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. Derive an expression for Numerical aperture in terms of acceptance angle and relative refractive index profile. (08 Marks)
- b. What is Attenuation? Explain the following attenuation mechanisms with relevant expressions : i) Absorption ii) Scattering losses. (08 Marks)
- c. For a 30 km long fiber, attenuation is 0.8 dB/km at 1300 nm. If a 200 μW power is launched into the fiber, find the O/P power. (04 Marks)

**OR**

- 2 a. Explain material dispersion with relevant expressions. (06 Marks)
- b. Sketch and explain :  
i) Step index fibers ii) Graded index fiber with core and cladding diameters (08 Marks)
- c. Classify and explain different fiber materials used in optical fibers. (06 Marks)

**Module-2**

- 3 a. Explain the concept of WDM with implementation diagram. (06 Marks)
- b. Construct and explain surface emitter LED with neat diagram. (08 Marks)
- c. A given Silicon Avalanche Photodiode has a Quantum efficiency of 65% at a wavelength of 900 nm. Suppose 0.5 μW of optical power produces a multiplied photocurrent of 10μA. Calculate i) Primary photo current ii) Multiplication factor iii) Responsivity (06 Marks)

**OR**

- 4 a. Explain the working of Faraday rotation isolator with neat diagram. (06 Marks)
- b. Construct and explain Fabry Perot LASER with neat diagram. (08 Marks)
- c. Explain PIN photodiode with neat diagram. (06 Marks)

**Module-3**

- 5 a. With neat diagram, explain Frequency reuse concept with cluster size  $k = y$ . (06 Marks)
- b. What is Fading? Explain different types of small scale fading with relevant diagram. (10 Marks)
- c. A US AMPS analog cellular system is allocated 12.5 MHz for each simplex band. If the Guard band at either end of the allocated spectrum is 10 KHz and the channel bandwidth is 30 KHz. Find the number of channels available in the system. (04 Marks)

**OR**

- 6 a. Explain 2G digital cellular systems with their specifications. (04 Marks)
- b. Explain the following propagation mechanism with relevant diagram :  
i) Reflection ii) Diffraction. (08 Marks)
- c. Derive an expression for frequency reuse ratio in terms of cluster size given by  $Q = \sqrt{3K}$ . Assume Regular Hexagonal geometry. (08 Marks)

**Module-4**

- 7 a. Explain main parts of a basic cellular system connected to PSTN with neat diagram. (10 Marks)
- b. Explain the concept of OFDM used in OFDMA with neat diagram. (06 Marks)
- c. Consider GSM which uses 25 MHz for the forward link, which is divided into radio channels of 200 KHz each with 8 time slots per channel. Find the number of simultaneous subscribers that can be accommodated in GSM – Assuming no Guard band. (04 Marks)

**OR**

- 8 a. Explain the TDMA / FDMA hybrid techniques used in  
i) IS – 136 system ii) GSM system with relevant diagrams. (08 Marks)
- b. With neat diagram, explain the steps required to establish Mobile to Mobile call. (06 Marks)
- c. Explain the concept of FDMA / FDD used in AMPS analog cellular system. (06 Marks)

**Module-5**

- 9 a. Explain different identifiers used in GSM system with relevant formats. (10 Marks)
- b. List any 8 specifications of GSM air interface standard. (04 Marks)
- c. Explain GSM Traffic Channels with relevant diagram. (06 Marks)

**OR**

- 10 a. Explain different hand – off procedures used in GSM. (04 Marks)
- b. Explain GSM hyper frame format with neat diagram. (08 Marks)
- c. Explain GSM signaling protocol architecture with different layers and neat diagram. (08 Marks)

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