QP Code: SN23BTECH237 | Reg. No | | | | | | | | | | | AR 23

# Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
## (GIET University)

B. Tech (Fifth Semester - Regular) Examinations, November – 2025

## 23BECPE35011 - Fiber Optic Communications

(Electronics and Communication Engineering)

Time: 3 hrs | Maximum: 60 Marks

**Answer ALL questions**

**(The figures in the right-hand margin indicate marks)**

**PART – A** **(2 x 5 = 10 Marks)**

| Q.1. Answer ***ALL*** questions | | CO # | Blooms Level |
|---|---|---|---|
| a. | A step index fiber has the normalized frequency of 26.6 at 1300 nm. If the core radius is 25 μm, find the numerical aperture. | CO1 | K3 |
| b. | What is Fresnel's Reflection loss and how it can be minimised? | CO2 | K2 |
| c. | Draw the noise equivalent circuit of a photodetector. | CO3 | K1 |
| d. | Explain stimulated emission | CO4 | K2 |
| e. | What is an optical isolator? | CO5 | K1 |

**PART – B** **(10 x 5 = 50 Marks)**

| Answer ***all*** the questions | | Marks | CO # | Blooms Level |
|---|---|---|---|---|
| 2. a. | A step index fiber has an acceptance angle of $20^0$ in air and a relative refractive index difference of 3% Estimate the NA and the Critical angle at the core-cladding interface. | 5 | CO1 | K5 |
| b. | Define Critical Angle, Acceptance angle, NA and TIR. | 5 | CO1 | K2 |
| | (OR) | | | |
| c. | A step index optical fiber has a core refractive index of 1.48 and cladding refractive index = 1.46 and a core radius of 100μm. Calculate NA, Acceptance angle, Critical angle and pulse broadening per unit length. | 5 | CO1 | K2 |
| d. | Explain basic blocks of optical communication using suitable diagram. | 5 | CO1 | K1 |
| 3.a. | A step index single mode fiber has a core refractive index of 1.45 and $\Delta$ =2%. If the material dispersion at 1.55 μm for this fiber is 7 ps $nm^{-1}$ $km^{-1}$. Design the radius of the core so that the total dispersion at this wavelength is zero**.** | 5 | CO2 | K6 |
| b. | Explain Double crucible method of Fiber fabrication. | 5 | CO2 | K1 |
| | (OR) | | | |
| c. | Derive expression of multipath time dispersion of the fiber due to intermodal dispersion. | 5 | CO2 | K4 |
| d. | Explain various types of losses that occur in optical fiber due to attenuation. | 5 | CO2 | K2 |
| 4.a. | Describe the double hetero structure construction of LED. | 5 | CO3 | K1 |
| b. | With suitable diagram explain splicing in optical fiber. | 5 | CO3 | K2 |
| c. | Explain structure and operation of SLED with suitable diagram | 5 | CO3 | K2 |
| d. | Explain different types of optical connectors with suitable diagram. | 5 | CO3 | K2 |
| 5.a. | A P-N diode has a quantum efficiency of 70% for photons of energy $1.52\times10^{-11}$J calculate the wavelength at which the diode is operating and the optical power required to achieve a photo current of 3$\mu$A. | 5 | CO4 | K4 |

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|---|---|---|---|---|
| b. | Explain the principle, construction and working of APD. | 5 | CO4 | K2 |
| c. | What is Noise? List and explain various types of noises encountered in the detector of an optical communication link? Establish S/N. | 5 | CO4 | K3 |
| d. | Explain LASER Action with suitable diagram. | 5 | CO4 | K2 |
| 6.a. | Explain the principle, construction and working of SOA. | 5 | CO5 | K2 |
| b. | Write the basic principle of wavelength division multiplexing. | 5 | CO5 | K1 |
| | (OR) | | | |
| c. | Discuss the principle, construction and working of EDFA. | 5 | CO5 | K2 |
| d. | Write a short note on WDM Components. | 5 | CO5 | K1 |

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