

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree Examination (Regular and Supplementary), December 2020

Course Code: EC405**Course Name: OPTICAL COMMUNICATION**

Max. Marks: 100

Duration: 3 Hours

PART A*Answer any two full questions, each carries 15 marks.*

Marks

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| 1 | a) Explain the general light wave system with figure. | (5) |
| | b) Write a short note on scattering losses. | (5) |
| | c) Consider a multimode fiber that has a core refractive index $n_1 = 1.48$ and a cladding index $n_2 = 1.46$. Find (a) critical angle at the core- cladding interface, (b) the N.A. for the fiber, and (c) the acceptance angle in air for the fiber. | (5) |
| 2 | a) Write a short note on photonic crystal fibre with figure. | (5) |
| | b) Briefly explain operation of Surface Emitting LED with figure. | (7) |
| | c) Write a short note on Amplified Spontaneous Emission noise. | (3) |
| 3 | a) Write a short note on bending losses in optical fiber. | (5) |
| | b) Explain the various LED characteristics. | (5) |
| | c) Write a short note on intramodal dispersion. | (5) |

PART B*Answer any two full questions, each carries 15 marks.*

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| 4 | a) Explain the structure of avalanche photodiode with figure. | (6) |
| | b) Consider the photons are incident on a PIN photodiode, which has a responsivity of 0.65A/W . If the optical power level is $10\mu\text{Watts}$. Calculate the photocurrent generated. | (5) |
| | c) Derive expression for Quantum or Shotnoise in photodetector. | (4) |
| 5 | a) Briefly explain the Link Power Budget with figure. | (5) |
| | b) Consider a LED driven circuit has a rise time of 15 ns. Taking a typical LED spectral width of 40nm and has a material dispersion related rise time degradation of 21ns over the 6km link. Consider the receiver has 25MHz bandwidth and has the rise time degradation from the receiver is 14ns. If the selected fiber has a 400MHz.km bandwidth-distance product with q (parameter) = 0.7, and the modal-dispersion-induced fiber rise time is 3.9ns. Find the value of link rise time. | (6) |
| | c) Write a short note on GH effect. | (4) |

- 6 a) Describe the working of IMDD system with figure. (5)
b) Briefly explain design of optical receivers. (5)
c) Write a short note on probability of error in digital receiver performance. (5)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Write a short note on EDFA with figure. (8)
b) Explain the various advantages of SOA. (6)
c) Briefly explain Raman Amplifier with figure. (6)
- 8 a) Briefly explain the WDM concept. (7)
b) Write a short on Bragg Grating with figure. (7)
c) Briefly explain tunable filters. (6)
- 9 a) Briefly explain the free space optical communication with block diagram. (7)
b) Consider a fiber grating with the following parameter, $L=0.5\text{cm}$, $\lambda_{\text{Bragg}} = 1530\text{nm}$, $n_{\text{eff}} = 1.48$, $\delta n = 2.5 \times 10^{-4}$ and $\eta = 82\%$. Calculate the coupling coefficient κ and the full bandwidth $\Delta\lambda$ over the maximum reflectivity. (6)
c) Explain the working of OTDR with diagram. (7)
