

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)
