

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019**

**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

- 1 a) Draw the block diagram of a light wave system. Mention the advantages of Optical fiber Communication system. (5)
- b) Explain the working principle of laser action? How a semiconductor diode functions like a laser diode? (10)
- 2 a) Differentiate between spontaneous and stimulated emission. (5)
- b) Explain the mode theory for the propagation of light in optical fiber. (10)
- 3 a) Explain the Modified Chemical Vapor Deposition process in fiber fabrication. (5)
- b) Explain the Numerical Aperture of an optical fiber with neat diagram. Calculate the fractional index change for a given optical fiber if the refractive indices of the core and cladding are 1.563 and 1.498 respectively. Also, calculate (i) numerical aperture (ii) angle of acceptance in air. (10)

**PART B**

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

- 4 a) Briefly explain the different selection criteria for detectors using in optical communication. (5)
- b) Draw the schematics of pin photodiode and APD and explain its working. (10)
- 5 a) What is meant by responsivity? How it is related to quantum efficiency? (5)
- b) A transmitter has an output power of 0.1mW. It is used with a fiber having NA=0.25, attenuation of 6dB/Km and length 0.5 km. The link contains two connectors of 2dB average loss. The receiver has a minimum acceptable power (sensitivity) of -35dBm. The design has allowed a 4dB margin. Calculate the link power budget. (10)

- 6 a) An InGaAs pin photodiode has  $\lambda=1300$  nm,  $I_D = 4$  nA,  $\eta_i=0.90$ ,  $R_L=1000$   $\Omega$ , and the surface leakage current is negligible. The incident optical power is 300nW (-35 dBm) and the receiver bandwidth is 20 MHz. Find the various noise terms of the receiver. (5)
- b) What are the essential components required for establishing a point- to point link. (10)  
What are the various losses associated with it? Explain with neat optical power loss model.

### PART C

*Answer any two full questions, each carries 20 marks.*

- 7 a) Explain the Fiber Bragg Grating technology and point two applications. (7)
- b) Explain the working of Semiconductor Optical Amplifier. (7)
- c) Compare the performance of different optical amplifiers. (6)
- 8 a) Explain the working principle of EDFA. Give the advantages of EDFA. (10)
- b) How does an OTDR work? Draw the typical OTDR trace. Name two faults that can be detected by OTDR. (10)
- 9 a) Explain with block diagram the working of optical add/drop multiplexer. Explain why it is required in optical communication system. (7)
- b) Explain the working of TDFA. (7)
- c) What is Li Fi technology? (6)

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