No. of Pages:2

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M.TECH DEGREE EXAMINATION, DECEMBER 2018

Branch:Electronics and Communication

Stream(s):

1) Microwave and TV Engineering
2) Telecommunication Engineering

Course Code & Name:

01EC6211:Optical Communication Systems

Answer *any two full* questions from *each* part

Limit answers to the required points.

Max. Marks: 60 Duration: 3 hours

PART A

1. a. What are different dispersive effects and their causes in single mode fibers. Graphically demonstrate the zero dispersion condition. 5

   b. A step index fiber has a core diameter of 8μm and a core refractive index of 1.48. Find the numerical aperture of the fiber and estimate the shortest wavelength of light which allows single mode operation when the relative refractive index difference for the fiber is 1%. 4

2. a. Explain the light generation technique in semiconductors. With necessary diagrams explain the structure of a hetro junction LED. 6

   b. A hetrojunction InGaAsP LED emitting at peak wavelength of 860nm has radiative and non radiative recombination times of 25ns and 75ns respectively. If the drive current is 25mA find the internal quantum efficiency and internal power level. 3

3. a. An InGaAs PIN diode having quantum efficiency 90%, dark current 4nA operating at a wavelength of 1300nm with a transmission rate of 40Mbps subjected to incident optical power of 300nW . The load resistance is 1K and negligible surface leakage current.Calculate the photo current generated, the mean square values of noise components and SNR. 9

PART B

4.	a.	Explain a simple point to point light wave system	3
	b.	Make the power budget and calculate the maximum transmission distance for a1310nm light wave system operating at 100Mb/s and using an LED for launching-13dBm of average power into the fiber. Assume 0.2dB/K m fiber loss, 0.2dB splice loss every 2 Km, 1dB connector loss at each end of fiber link, and 100nW receiver sensitivity. Allow 6 dB system margin.	6
5.	a.	Explain the noise present in Optical amplifiers. Show that noise figure of an ideal amplifier is 3dB.	9
6.	a.	Explain the principle of operation of Raman amplifiers.	5
	b.	Explain the prechirp technique of dispersion compensation.	4

PART C

7.	a.	With a block diagram explain a soliton communication link.	6
	b.	What is Gordon-Haus jitter? Differentiate between dark and bright solitons.	6
8.	a.	Which are the low loss transmission windows used for WDM. Briefly outline the challenges of DWDM.	6
	b.	Describe the structure of FBG. Design an add-drop multiplexer using Fiber Bragg grating and circulator.	6
9.	a.	Derive the expression for SNR of heterodyne coherent detection(Use suitable approximations).	8
	b.	With a block diagram describe a dual filter FSK receiver.	4