Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree Regular and Supplementary Examination December 2021 (2015 Scheme)

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) Classify light wave systems based on the performance.   (8)

   b) List the different scattering losses in optical fiber.   (3)

   c)   A silica optical fiber with a core diameter large enough to be considered by ray   (4)
       theory analysis has a core refractive index of 1.50 and a cladding refractive
       index of 1.47.

       Determine:

       (a) the critical angle at the core–cladding interface

       (b) the NA for the fiber

       (c) the acceptance angle on air for the fiber.

2 a) What is intermodal Dispersion? How to modify the structure of the optical fiber   (6)
       so as to reduce intermodal dispersion.

   b) Compare the performance of LED and laser diode.   (5)

   c) Draw the dispersion versus wavelength graph of dispersion shifted and   (4)
       dispersion flattened fibers.

3 a) Describe modified chemical vapour deposition method for the preparation of   (8)
       optical fibers

   b) Write note on noise in laser diode.   (4)

   c) The energy difference between two states of a material is 10^{-4}. Calculate the   (3)
       frequency of the electromagnetic wave emitted

PART B

Answer any two full questions, each carries 15 marks.

4 a) Draw the structure and electric field distribution of RAPD. How is multiplication   (6)
       achieved in RAPD?

   b) The quantum efficiency of silicon RAPD is 85% which is used for the detection   (4)

of wavelength 0.9μm. When the incident optical power is 0.5 μW, the output current from the device is after multiplication is 12μA. Determine the multiplication factor of the RAPD.

	c)	Discuss the design issues to be addressed in fiber optic communication system	(5)
5	a)	How to calculate link power budget of an optical link. Consider basic components only.	(7)
	b)	GaAs has a bandgap energy of 1.43.eV at 300k. Determine the wavelength above which an intrinsic photo detector fabricated using GaAs will cease to operate.	(3)
	c)	Write notes on the semiconductor materials used for making photo detectors.	(5)
6	a)	Draw the schematic diagram of coherent optical communication system which uses homodyne detection. What are the advantages and disadvantages.	(9)
	b)	What is quantum limit of detection?	(3)
	c)	What is Gordon Haus effect in soliton system.	(3)

PART C
Answer any two full questions, each carries 20 marks.

7	a)	Draw the block schematic, energy band diagram and gain spectrum of EDFA. Give its technical features	(10)
	b)	Give different applications of optical amplifiers.	(5)
	c)	Compare 980nm pump and 1480 pump used in EDFA.	(5)
8	a)	What is FBG? With the help of necessary diagram, describe the method of optical filtering using FBG	(7)
	b)	Differentiate between core interaction type and surface interaction type optical couplers	(5)
	c)	What is free space optics? Write the advantages and challenges of free space communication,	(8)
9	a)	Describe the principle of raman amplifier. Compare its features with EDFA.	(8)
	b)	What is OTDR? Plot sample OTDR trace and name three applications of OTDR	(7)
	c)	What are the advantages of LiFi technology?	(5)

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