Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree 7th semester (S,FE) (FT/PT) Exam April 2025 (2019 Scheme)

Course Code: ECT413

Course Name: OPTICAL FIBER COMMUNICATION

Max. Marks: 100 **Duration: 3 Hours**

PART A

Answer all questions, each carries 3 marks. Marks

1		Draw the basic structure of optical fiber. What is the function of cladding?	(3)
2		Illustrate propagation of light ray through optical fiber.	(3)
3		Define macroscopic and microscopic bending losses in optical fiber.	(3)
4		What is waveguide dispersion?	(3)
5		The energy difference between two states of a material is 10^{-4}. Calculate the frequency of the electromagnetic wave emitted.	(3)
6		Write note on noise in laser diode.	(3)
7		Give different applications of optical amplifiers.	(3)
8		Write the principle of Raman amplifier.	(3)
9		Describe WDM concept.	(3)
10		What are the advantages of Li-Fi technology?	(3)

PART B

Answer any one full question from each module, each carries 14 marks.

Module I

11	a)	Describe a) numerical aperture b) acceptance angle and c) relative refractive index difference of optical fiber. Draw necessary sketches.	(8)
	b)	For a multimode fiber, n1 = 1.47 and n2 = 1.45. Find the numerical aperture, acceptance angle angle and relative index difference.	(6)

OR

12	a)	Draw the block diagram of optical fiber communication system and describe the need of each block.	(9)
	b)	What is V number? How it is related to the number of guided modes in a single mode optical fiber?	(5)

Module II

13	a)	Describe linear and nonlinear scattering losses in optical fiber.	(10)

b) Summarise attenuation in optical fiber due to intrinsic fiber material properties. (4)

OR

14 a) Describe intermodal dispersion. How is it reduced in graded index fiber? (10)

b) Differentiate between core interaction type and surface interaction type optical couplers. (4)

Module III

15 a) Describe the principle of LASER. Mention the advantages of Laser over LED. (8)

b) A photodiode has a quantum efficiency of 65% when photons of energy 1.5 x 10^{-19} J are incident upon it. Calculate the incident optical power required to obtain a photo current of 2.5μA. (6)

OR

16 a) Discuss various types of noise in photodetectors. (8)

b) A silicon PIN photodiode incorporated into an optical receiver has a quantum efficiency of 60% when operating at a wavelength of 0.9 μm. The incident optical power at this wavelength is 200 nW and the post-detection bandwidth of the receiver is 5 MHz. Find the shot noise generated in the photodiode. (6)

Module IV

17 a) Draw the block schematic, energy band diagram and gain spectrum of EDFA. Give its technical features. (8)

b) What is TDFA? Explain its working. (6)

OR

18 a) Describe the principle of SOA. Also write the characteristics. (9)

b) Compare the performance of EDFA and SOA. (5)

Module V

19 a) What is OTDR? Plot sample OTDR trace and name three applications of OTDR (8)

b) What is FBG? With the help of necessary diagram, describe the method of optical filtering using FBG. (6)

OR

20 a) Describe VLC with the help of a block diagram. Give any five applications. (9)

b) Write short note on add/drop multiplexer. (5)

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