Reg. No. ☐☐☐☐☐☐☐☐☐☐☐☐☐

B.E / B.TECH. DEGREE EXAMINATION, MAY 2023
Seventh Semester
EC18702-OPTICAL COMMUNICATION AND NETWORKS
(Electronics and Communication Engineering)
(Regulation 2018)

TIME: 3 HOURS   **MAX. MARKS: 100**

Course Outcomes	Statement
CO 1	Evaluate the transmission characteristics and classify the structures of Optical fiber and types
CO 2	Investigate the various signal degradation factors associated with optical fiber.
CO 3	Evaluate the various optical sources and optical detectors and their use in the optical communication system
CO 4	Examine the digital transmission and its associated parameters on system performance with the optical fiber measurements and various coupling techniques
CO 5	Enrich their knowledge on design of optical fiber networks such as SONET/SDH and optical CDMA systems

PART- A (10 x 2 = 20 Marks)
(Answer all Questions)

		CO	RBT LEVEL
1.	State the necessity of cladding for an optical fiber.	1	3
2.	List down the importance of "Critical Angle" in optical fiber.	1	2
3.	The mean optical power launched into an 8 km length fiber is 120µW, the mean optical power at the fiber output is 3µW? Determine the overall signal attenuation in dB/km.	2	3
4.	Furnish the concept of dispersion in optical fiber.	2	2
5.	Why silicon is not preferred to fabricate LED or LASER diode?	3	3
6.	Differentiate direct and indirect band gap materials.	3	3
7.	Categorize the types of preamplifiers.	4	2
8.	What do you mean by Responsivity?	4	2
9.	State the principle of WDM network.	5	2
10.	Distinguish SONET and SDH.	5	3

PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11. (a)	Using the basic Maxwell's equations for a source-free condition, derive the mode equations for the cylindrical fiber.	**(14)**	1	3

(OR)

(b)	**(i)**	Explain the elements of an optical fiber transmission link by drawing the relevant diagram that shows how each component functions.	**(8)**	**1**	**3**
	(ii)	A step index fiber has 10 μm radius. The refractive indexes of the core & cladding are 1.47 and 1.45 respectively. Determine its normalized frequency and hence number of modes that propagate in this fiber at 1350 nm?	**(6)**	**1**	**3**
12. (a)		Illustrate the material and waveguide dispersion mechanisms with necessary mathematical expressions.	**(14)**	**2**	**4**

(OR)

(b)		Explain the Pulse Broadening in Graded Index Fiber along with its effects on information carrying capacity of fiber using relevant expressions.	**(14)**	**2**	**4**
13. (a)		Derive the expression for the quantum efficiency of a double hetero structure of LED.	**(14)**	**3**	**4**

(OR)

(b)	**(i)**	With the relevant diagram, explain the surface emitting LED structure and emphasis its drawbacks when compared with edge emitters.	**(8)**	**3**	**4**
	(ii)	Analyze the concept of fiber splicing and provide an explanation of fusion splicing with neat diagram.	**(6)**	**3**	**4**
14. (a)		Construct the optical receiver operation and its performance with neat diagram.	**(14)**	**4**	**3**

(OR)

(b)		Discuss the Fiber Diameter and Refractive Index Profile measurements in detail.	**(14)**	**4**	**3**
15. (a)		Deduce the basic SONET frame structure and layering concept with relevant diagrams.	**(14)**	**5**	**3**

(OR)

(b)	**(i)**	Discuss the salient feature of Solitons using appropriate diagrams.	**(6)**	**5**	**3**
	(ii)	Illustrate the detailed notes on Ultra High Capacity Networks and its applications.	**(8)**	**5**	**3**

PART- C (1 x 10 = 10 Marks)
(Q.No.16 is compulsory)

			Marks	**CO**	**RBT LEVEL**
16.		Describe the ray theory transmission behind the optical fiber communication with a special mention about the reflection, refraction, total internal reflection, Snell's law, critical angle and phase-shift.	**(10)**	**1**	**4**

****