

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)**

**CLASS: B.TECH  
BRANCH: ECE**

**SEMESTER : VI  
SESSION : SP/2023**

**SUBJECT: EC355R1 FIBER OPTIC COMMUNICATION**

**TIME: 3 Hours**

**FULL MARKS: 50**

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
- 

		CO	BL
Q.1(a)	Mention the four distinct advantages of optical fiber as a transmission medium. Draw a block diagram to illustrate the elements of an optical fiber transmission link and describe the different blocks in brief.	[5] 1	1,2
Q.1(b)	Discuss the absorption losses in optical fibers by comparing and contrasting the intrinsic and extrinsic absorption mechanisms. Consider a 30 km long optical fiber that has an attenuation of 0.4 dB/km at 1310 nm. Find the optical output power $P_{out}$ in dBm if 200 $\mu$ w of optical power is launched into the fiber.	[5] 1	2,3
Q.2(a)	Write down the difference between LED and LASER diode. The radiative and nonradiative recombination lifetimes of the minority carriers in the active region of a double-heterojunction LED are 60 ns and 100 ns respectively. Determine the total carrier recombination lifetime and the power internally generated within the device when the peak emission wavelength is 0.87 $\mu$ m at a drive current of 40 mA.	[5] 2	1,3
Q.2(b)	Describe briefly the DFB Laser diode. A GaAs laser operating at 850 nm has a 500- $\mu$ m length and a refractive index $n = 3.7$ . Estimate the frequency spacing and the wavelength spacing.	[5] 2	1,5
Q.3(a)	Explain with a diagram the principle of operation of Reach-through avalanche photodiode (RAPD). Discuss the factors that determine the response speed of the photodetector.	[5] 3	2
Q.3(b)	Draw a diagram of the optical power loss model for a point-to-point link. Formulate an expression of link power budget analysis.	[5] 3	1,6
Q.4(a)	Explain the operational principles of WDM with a suitable diagram. What are the active and passive devices used in the WDM network?	[5] 4	2,1
Q.4(b)	Discuss the architecture of an erbium-doped fiber amplifier (EDFA). Explain the functions of components of EDFA architecture used for bi-directional pumping.	[5] 4	2
Q.5(a)	Distinguish SONET and SDH. Explain how traffic is resumed in the case of the UPSR SONET ring and BLSR SONET ring network during a node failure.	[5] 5	4,3
Q.5(b)	Explain various nonlinear effects on optical network performance in brief.	[5] 5	2,5

:::28/04/2023 M:::