

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

**CLASS: BTECH
BRANCH: ECE**

**SEMESTER: VI
SESSION: SP/2025**

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.
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		CO	BL
Q.1(a)	Define and discuss the importance of Numerical aperture and V-number in an Optical fiber.	[5] 1	1,2
Q.1(b)	A 50 km long optical fiber link operating at 850 nm offers an average attenuation of 0.5 dB/km. Evaluate the optical powers (in μW and in dBm) at 30 km from the input if the input power coupled to the fiber is $100 \mu\text{W}$?	[5] 1	5,6
Q.2(a)	Why are LEDs used mainly with multimode fibers? Compare the various features of Surface emitting LED and Edge emitting LEDs.	[5] 2	1,5
Q.2(b)	What is a fiber splice? Discuss the various techniques used for splicing the fiber.	[5] 2	1,2
Q.3(a)	Explain the avalanche multiplication process in an Avalanche photodiode (APD). Illustrate the electric field profile of a Reach through APD (RAPD) with respect to its structure.	[5] 3	3
Q.3(b)	Compare the bandwidth and mean square value of the thermal noise current for two separate LZ and HZ preamplifier configurations of an optical receiver. Given $R_a = R_b = 50 \text{ ohm}$ for LZ, and $R_a = R_b = 5 \text{ M ohm}$ for HZ configurations respectively. $C_a = 4 \text{ pF}$ and $C_b = 6 \text{ pF}$ for both the configurations. Where R_a and C_a are the input resistance and capacitance the preamplifier, and R_b and C_b are the bias resistance and input capacitance of the detector respectively.	[5] 3	4,5
Q.4(a)	With the help of suitable schematic diagrams, explain the process of absorption, non-radiative emission, spontaneous emission, and stimulated emission when an Erbium doped fiber amplifier (EDFA) is pumped with a 980 nm laser diode.	[5] 4	3
Q.4(b)	A 2 X 2 tapered fiber coupler is fed with an input optical power level of $P_0 = 200 \mu\text{W}$. The output powers at the other three ports are $P_1 = 90 \mu\text{W}$, $P_2 = 85 \mu\text{W}$, and $P_3 = 6.3 \text{ nW}$. Determine the coupling ratio, excess loss, insertion losses between ports 0 to 1 and ports 0 to 2, and crosstalk.	[5] 4	5
Q.5(a)	With the help of suitable diagram, discuss the scheme of reconfiguration of a SONET ring consisting of four-fiber bidirectional line switched ring (BLSR) under transceiver or line failure condition.	[5] 5	2,3
Q.5(b)	What are a few applications of non-linear scattering? Distinguish between Stimulated Brillouin scattering (SBS) and Stimulated Raman scattering (SRS). What are the factors on which threshold optical power required for SBS and SRS depend on?	[5] 5	2,3

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