BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2025)

CLASS: BTECH **SEMESTER: VI/ADD**
BRANCH: ECE **SESSION: SP/2025**

SUBJECT: EC355R1 FIBER OPTIC COMMUNICATION

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	Discuss the advantages and disadvantages of Optical fibers.	[2]	1	1,5
Q.1(b)	A step-index silica fiber has a core refractive index of 1.48 and cladding refractive index of 1.47. calculate (i) the critical angle (w.r.t. axis) at the core-cladding interface, (Ii) the NA of the fiber, and (iii) the acceptance angle assuming the entrance medium to be air.	[3]	1	
Q.2(a)	Compare the characteristics of single mode step-index optical fiber, multi-mode step-index fiber, and graded index fiber.	[2]	1	5
Q.2(b)	A multimode step index fiber with a core diameter of 80 μm and a relative index difference of 1.5% is operating at a wavelength of 0.85 μm. If the core refractive index is 1.48, estimate : (a) the normalized frequency V for the fiber; (b) the number of guided modes; c) the maximum core diameter for an optical fiber with the same Δ and n_1 as this fiber for it be suitable for single-mode operation.	[3]	1	1,5
Q.3(a)	Distinguish between meridional rays and skew rays in an optical fiber.	[2]	1	4
Q.3(b)	What are the major components of dispersion in a single mode fiber? Discuss its effects.	[3]	1	1
Q.4(a)	List the advantages and drawbacks of light emitting diodes in comparison with injection laser diode.	[2]	2	1,3
Q.4(b)	A Surface emitting LED with a circular emitting area of radius 25μm has an axial radiance of 120 X 10^4 $Wm^{-2}sr^{-1}$ at an operating wavelength of 850 nm. The light emitted from the LED is to be coupled to a step-index fiber with a core radius of 30μm. The power coupled to the fiber under ideal condition is 250 μW. Estimate the numerical aperture of the fiber.	[3]	2	5
Q.5(a)	Discuss the criteria for launching power from the source to the fiber	[2]	2	2,5
Q.5(b)	With the help of suitable diagrams, show the various possible lensing schemes used to improve source-to-fiber coupling efficiency.	[3]	2	1,2

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