Revised 14/8/19 (9/10) Revised 14/8/19 (19BBS0041) Date. 07.08.2019.

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OPTICAL FIBER CHARACTERIZATION

Apparatus available

- Diode laser
- Optical fiber
- Laser - Fiber coupler
- Optical rail
- Pinhole photo detector
- Power supply for laser and detector output measurement unit.

SLO:

To determine numerical aperture of a given multimode optical fibre.

Theory:

A multimode optical fibre will only propagate light that enters the fiber within a certain cone, known as the acceptance cone of the fiber. The half angle of this cone is called the acceptance angle θ_a.

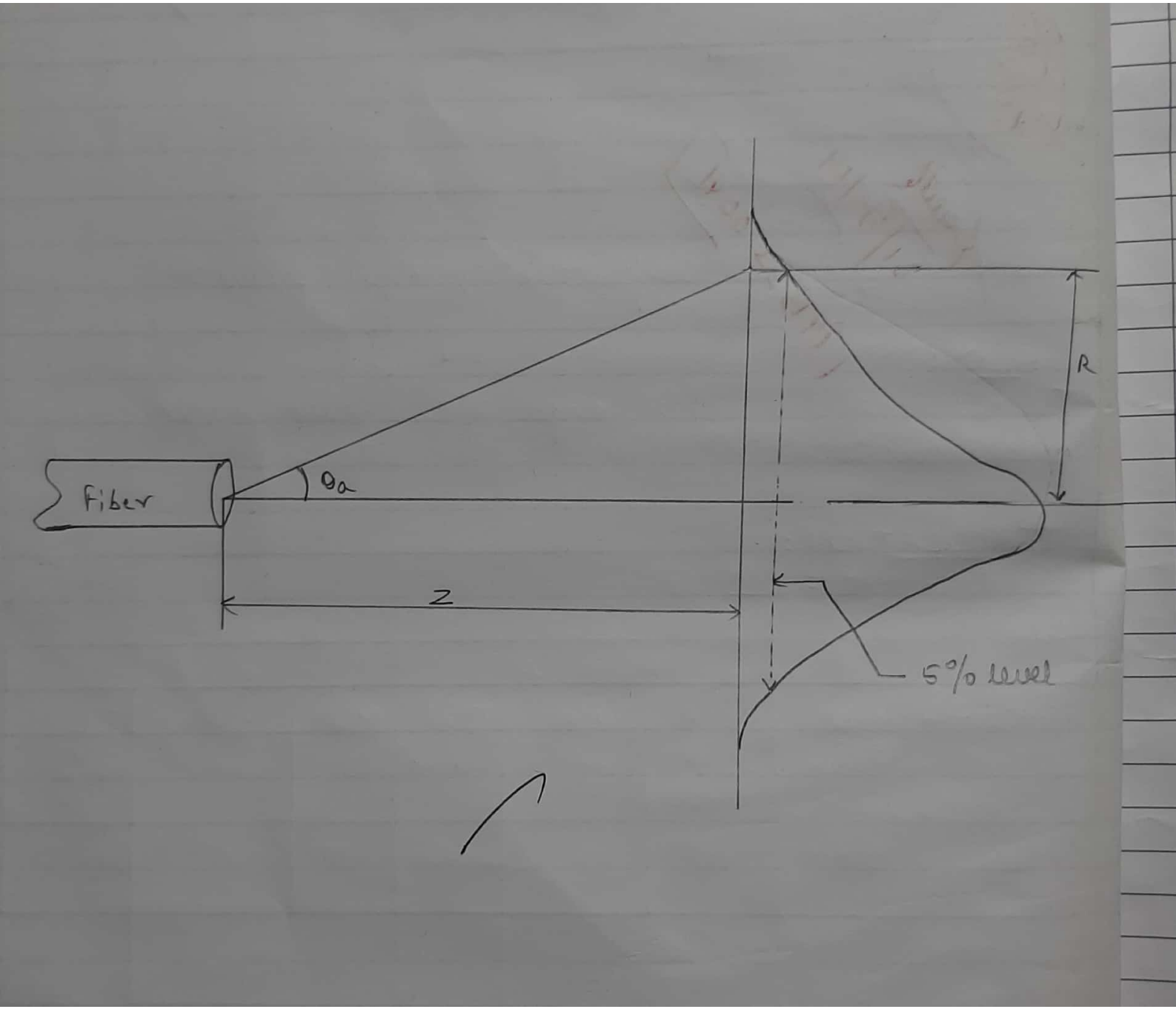
Acceptance angle, $\boxed{\theta_a = \tan^{-1}(D/2)}$

where, D is the diameter of far field intensity at 5% intensity level of the maximum attainable intensity and Z is the distance between the detector and the fiber output end.

$\boxed{NA = \sin\theta_a}$

$LC = \frac{5}{50} = 0.1\,mm$

Teacher's Signature : .....



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Z	Micrometer reading (mm)	Detector o/p current (μA)	R=D/2 (mm)
1mm	20.16	0	
	19.83	0.1	
	19.67	0.1	
	19.54	0.2	
	19.27	0.6	
	18.84	5.2	
	18.67	20	
	18.44	47.2	0.9
	18.23	79	
	18.16	95.2	
	17.83	82.1	
	17.47	47.1	
	17.26	4	
	16.84	0.5	
	16.47	0.1	

Result 1/8/19

Calculations:

5% of 95.2 = 4.76 μA.

D = 1.8mm.

$R = \frac{D}{2} = 0.9mm$

$\theta_A = \tan^{-1}\left(\frac{R}{Z}\right) = \tan^{-1}\left(\frac{0.9}{1}\right) = 41.99°$.

$N_A = \sin\theta_A = \sin(41.99) = 0.6690$

Result:

Numerical Aperture (N_A) of the given multimode optical fiber is ~~0.898~~ 0.6690

Teacher's Signature : .....