EXPT-8 OPTICAL FIBRE 26/9/19

AIM: To determine the numerical aperature and acceptance angle (θ_a) of given optical fibre

APPARATUS REQUIRED:

Diode Laser, Fibre coupler, optical fibre Fibre stand attached to screen,

BASIC THEORY:

Numerical aperature determine the light gathering or light coupling efficiency of an optical fibre.

N_A is a dimensionless quantity and is a measure of the acceptance angle of the fibre

$N_A = n_i \sin\theta_a$

θ_a is the acceptance angle of fibres and n_i is the idea of air ($n = 1$).

$N_A = \sin\theta_a$

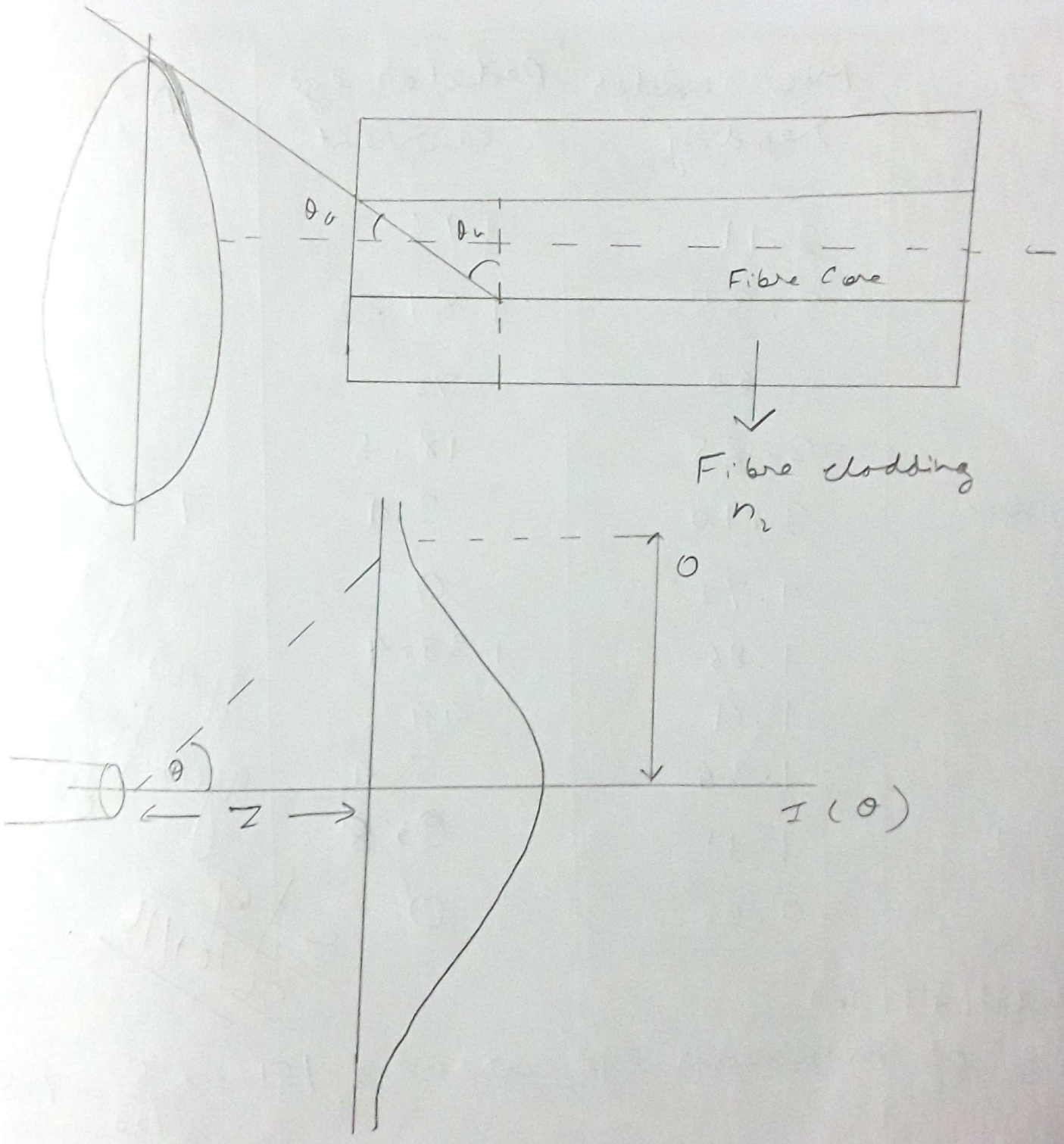
Using Snell's law: Maximum acceptance angle can be determined as:

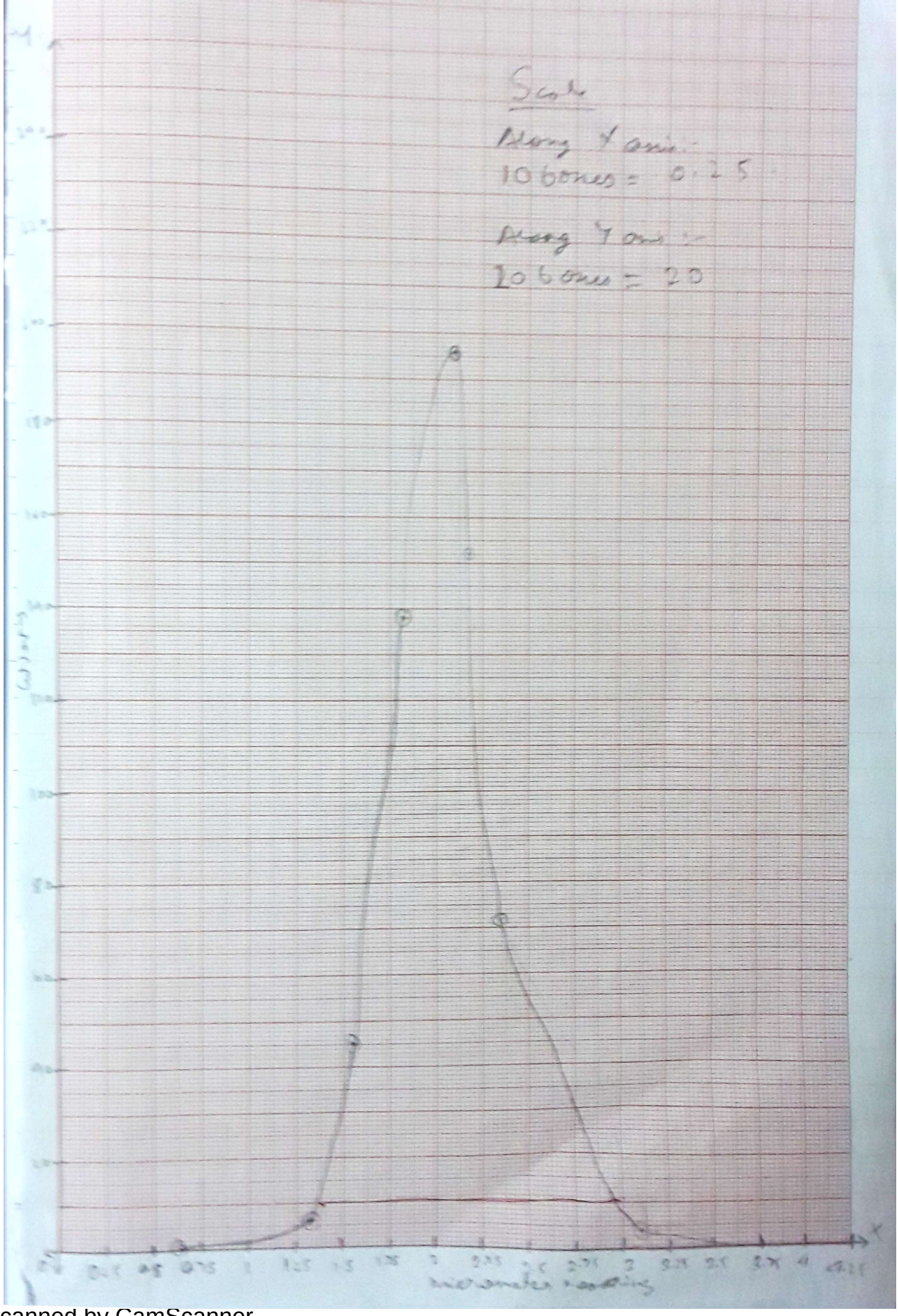
$$N_A = \sin\theta_n = \sqrt{n_1^2 - n_2^2}$$

If L is distance between the screen and output end of the capital fibre and d is the diameter of output beam on the screen,

$$N_A = \sin\theta_c = \frac{d}{\sqrt{d^2 + 4L^2}}$$

DIAGRAM:





OBSERVATION TABLE:

Z	Micrometer Reading	Detector ege Current	D
2mm	2.11	196	7.56
	2.35	151.2	
	2.60	72	
	2.85	18.5	
	3.10	3.1	
	4.72	0	
	1.86	138.4	
	1.61	44	
	1.36	5.4	
	1.11	0.8	
	0.62	0	

How did you find it out?

26/09/16

CALCULATION:

5% of maximum ege current $= 151.2 \times \frac{5}{100} = 7.56$

RESULT:

Numerical operature of a given multimode optical fibre is $7.56 \approx 8$.

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