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TOPIC: Optical fibre characterization

AIM: To determine numerical aperture of a given multimode optical fibre.

APPARATUS:

- Diode Laser
- Optical fibre
- Optical rail
- Detector output measurement unit
- Laser-Fiber coupler
- Pinhole photo detector
- Power supply for laser

FORMULAE USED:

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

$$\theta_a = \tan^{-1}\left(\frac{R}{Z}\right)$$

where, Z is the distance between the detector and fibre output end.

D is the diameter of far field intensity at 50% intensity level of the maximum attainable intensity.

$$NA = \sin\theta_a$$

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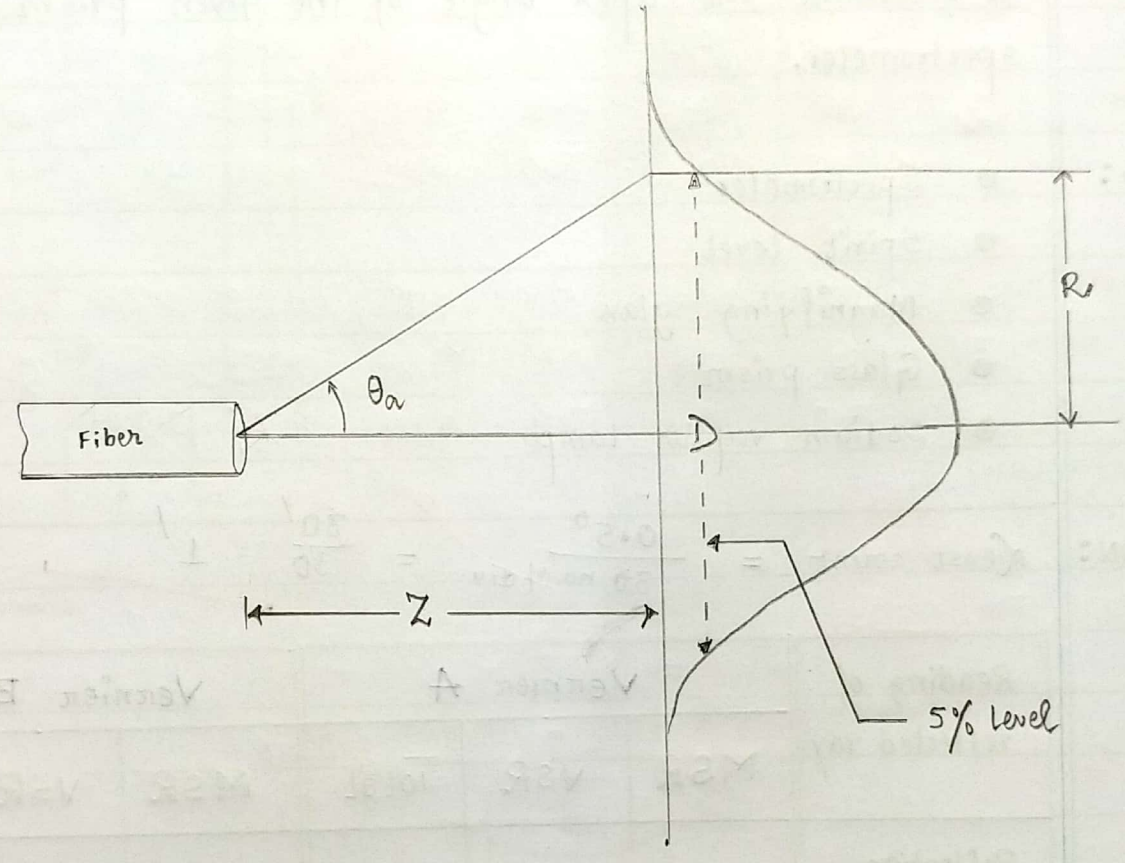

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READINGS:

Micrometer reading	Detector current o/p		
14.0	0		
13.5	0		
12.5	0		
12.33	0		
12.17	0.1		
12.00	0.2		
11.84	0.4	1.3	
11.67	1.3		
11.51	11.5		
11.34	45		
11.18	100.7		
11.01	158.2		
10.85	177.6		
10.68	136.2		
10.52	83.1		
10.355	34.3		
10.19	7.6		
10.02	0.8		
9.85	0.3		
9.69	0.1		
9.53	0	Ready	
9.365	0	19 BCF = 2105	
9.2	0	29 Aug 19	
9.03	0		
8.87	0		
8.70	0		

~~RESULT~~ :

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CALCULATION

Least count $= \frac{0.5}{30}$ mm $= 0.01$ mm

D = 5% of max

$= 11.54 - 10.21$

$= 1.3$

$$\tan\theta = \frac{R}{Z}$$

$$\theta = \tan^{-1}\left(\frac{R}{Z}\right)$$

$$= \tan^{-1}(0.65)$$

$$= 33.62^{\circ}$$

$$N_A = \sin\theta_0 = 0.5537$$

RESULT

Numerical aperture of the optical fibre = 0.5537 units

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