SUBJECT - APPLIED PHYSICS

EXPERIMENT NO.

NAME

Study of Numerical Aperture of optical Fiber.

OBJECTIVE

The objective of this experiment is to measure the numerical perture of the Plastic fiber provided with the kit using 660 nm wavelengths LED.

MATERIALS REQUIRED

Kit (Fiber Fool -B-P) 1 meter fiber cable NA JIG Steel ruler, Power Supply

THEORY

Numerical aperture refers to the maximum angle at which the light incident on the fiber end is totally internally and is transmitted properly along the fiber. The cone formed By the rotation of this angle along the axis of the fiber are the cone acceptances of the fiber. The light ray should strike the fiber end within its cone of acceptances else it is refracted out Of the fiber core.

PROCEDURE

• Slightly unscrew the cap of LED SFH756V (660nm) Do not remove the cap from the Cap. From the connector. Once the cap is loosened, insert the fiber into the fiber into the cap. Now tight the cap by screwing it back.

• Connect this power supply cables with proper polarity to kit while connecting this ensure that the power supply is off. Do not apply any TTL signal from Function Generator. Make the Connection as Shown.

• Keep pot P3 fully clockwise position and P4 fully anticlockwise position.

• Switch on the power supply.

• Insert the other end of the fiber into the numerical aperture measurement Jig. Hold the white sheet facing the fiber. Adjust the fiber such that it's cut Face is perpendicular to the axis of the fiber.

• keep the distance of about 10mm between the fiber tip and the Screen Gently tighten the screw and thus fix the fiber in the place.

• Now adjust pot P4 fully clockwise position and observe the illuminated Circular patch of light on the screen.

• Measure exactly the distance d and also the vertical and horizontal diameters MR and PN indicated in the FIG.4.1

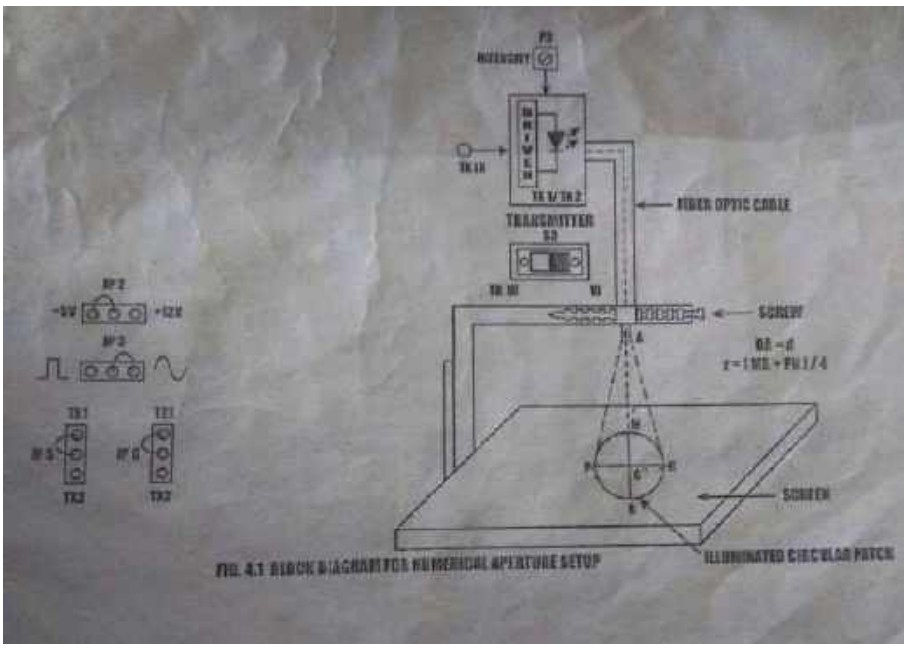
• Mean radius is calculated using the following formula

$$r = (MR + PR) /4$$

• Find the numerical aperture of the fiber using the formula

• NA $= \sin \theta_{max} = r / \sqrt{r^2 + d^2}$

• Where max is the maximum angle at which the light incident is properly Transmitted through the fiber.



OBSERVATION TABLE

S. No.	HEIGHT (d)	DIAMETER OF OPTICAL FIBER		RADIUS OF SPOT r =(MR+PN)/4	NA =$r / \sqrt{r^2 + d^2}$
		ALONG ONE DIRECTION(MR)	ALONG PERPENDICULAR DIRECTION (PN)		
1. 2. 3.		———			

CALCULATION

RESULT

The Numerical Aperture of the given fiber cable =

PRECAUTION

- It is very important that the optical sources should be properly aligned with the cable & distances from the launched point.
- The cable is properly selected to ensure that the maximum amount of optical power is transferred to the cable.
- This experiment is best performed in a less illuminated room.
- Keep Switch Faults in off Position.