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# Optical communication

Q1 a: Explain the difference between inter and intra model dispersion.

Inter model dispersion.

Ans: a) When a light pulse is fed into the fiber, it travel along the fiber through various modes of propagation.

b) Each mode having it own propagation vector.

c) It has own electric field pattern.

c) intro model dispersion :-

intro model dispersion is pulse spreading that occurs with in a single mode fiber it is also known as chromatic dispersion. and chromatic dispersion has two region

i) material dispersion

ii) waveguide dispersion.

Q.2

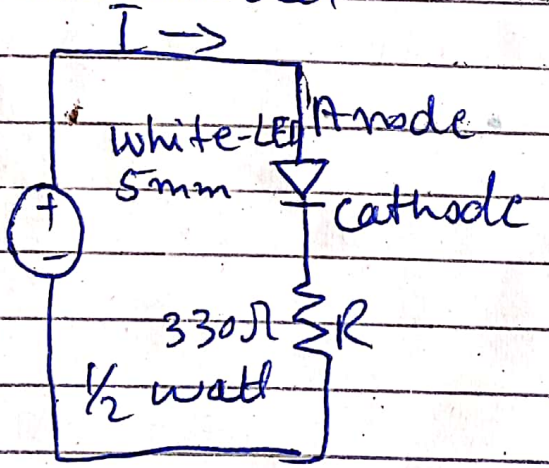
Q: Draw the electric circuit LED and explain the function of each component.

Ans.

⇒ Simple LED circuit diagram:

⇒ Components Required

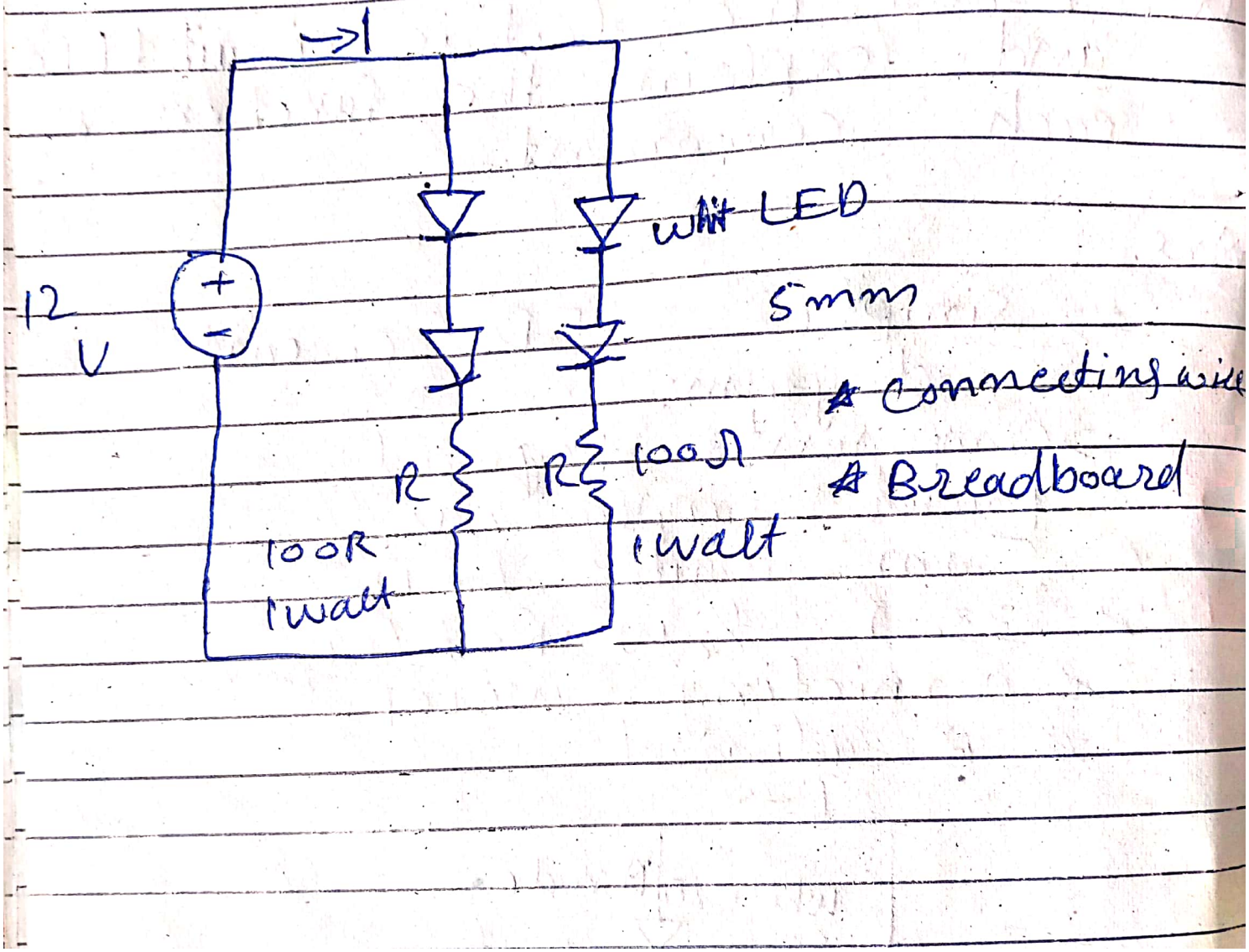
* power supply 12V
* 5mm white LED
* 330Ω ½W Resister
* connecting wires
* Breadboard




⇒ Parallel LED circuit

⇒ components Required

* 12V Power supply
* 4x 5mm white LED
* 2x 100Ω Resister (1 watt)



PART. B). What is homostructured and heterostructured LED. Also explain the drawbacks of homostructured LED and how does heterostructured LED cater these problems?

(Ans) ⇒ Homostructured LED:

Homostructured makes the device radiates a broad light beam and make coupling into fiber efficient.

⇒ Heterostructured LED:

Most LED is designed using heterostructured because it gives good confinement of recombination process.

⇒ Drawbacks of Homostructured:

A Homostructured LED has two major drawback

1). It's active region is to deffuse, which makes the device's efficiency very low. This is because electron-hole recombinations take place in various location, that is over a large area a situation that requires

high current density to ~~desired~~ support the desired level of radiated Power.

2). Second: This type of LED radiates a broadlight beam This makes the Coupling of this light into an optical fiber extremly inefficient and is the reason why you Can not find an LED with a homojunction in practical application

⇒ Heterostructured LED Cater problem :-

A double heterostructured is formed when two Semiconductor materials are grown into a "Sandwich"... if one of the Cladding layers is p-doped, the other cladding layer n-doped and the smaller energy gap Semiconductor material undoped, a p-i-n structure is formed.

Q3: Explain these losses.

i) Attenuation

Attenuation is a general terms that refer to any reduction on the strenght of a signal Attenuation ocur with any type of signal wheter digital or analog. sometimes called loss. attenuation is a natural concequence of signals transmission over long distance.

ii) Macrobending

Macrobend loss refer to losses included in bend around manderal (or corner in installation) generally more at the cable level or fiber, the bend neccessary to fit fiber inside splice closures or patch panel

iii) Microbending:

fiber often exhibit excess loss when they are spooled or cabled as the result of small deflection of fiber axis that are of random amplitude and are randomly distributed along the fiber. The loss included in optical fiber by these small random bends and stress in the fiber axis is called microbending loss.

iv) Scattering.

By vanige Beal in Fiber optic transmissions, scattering is the loss of signal caused by the diffusion of a light beam where the diffusion itself is caused by microscopic variation in the transmission medium. Scattering typically happens when a light signal hit an impurity in the fiber.

v) Absorption.

Absorption is a major cause of signal loss in an optical fiber and it is defined as the portion of attenuation resulting from the conversion of optical power into another energy form such as heat. Absorption in optical fiber is explained by these factors imperfection in the atomic structure of fiber.

Q4

a d- 50 µm NA = 0.250

wavelength 1330nm?

$$V = \frac{\pi d}{\lambda} \cdot NA$$

step 1:- $\frac{3.14 \times 50 \times 10^{-6} m \times 0.250}{1330 \times 10^{-9} m}$ calculate first

step 2 $N = V^2/4$ A