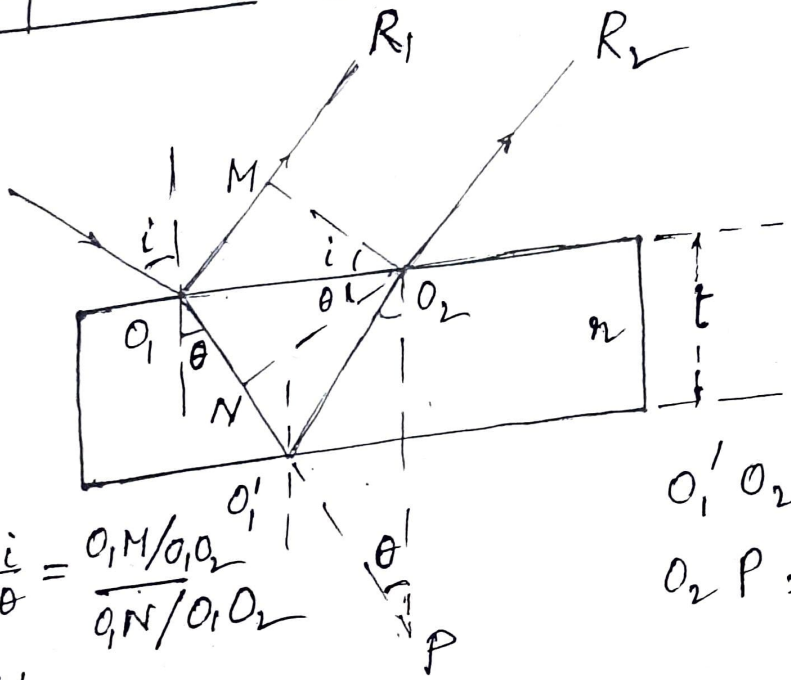
10. **Interference by division of amplitude : Two-beam interferometry**



$$n = \frac{\sin i}{\sin\theta} = \frac{O_1M/O_1O_2}{O_1N/O_1O_2}$$

$$n = \frac{O_1M}{O_1N}$$

$$O_1'O_2 = O_1'P$$

$$O_2P = 2t$$

Path difference between the rays O_1R_1 and O_2R_2 is

Δ' = path $O_1O_1'O_2$ in the film − path O_1M in air

$$\therefore = (O_1N + NO_1' + O_1'O_2)n - O_1M$$

$$= (NO_1' + O_1'P)n$$

$$= NP.n$$

$$= 2nt\cos\theta .$$

∴ Total path difference between O_1R_1 and O_2R_2 is

$$\Delta = \Delta' \pm \lambda/2$$

$$= 2\mu t \cos\theta \pm \lambda/2$$

Conditions of interference

Constructive interference

$$\Delta = 2\mu t \cos\theta \pm \lambda/2 = \text{even multiple of } \lambda/2$$

$$2\mu t \cos\theta = \text{odd multiple of } \lambda/2$$

$$2\mu t \cos\theta = (2m+1)\lambda/2$$

Destructive interference

$$2\mu t \cos\theta \pm \lambda/2 = \text{odd multiple of } \lambda/2$$

$$2\mu t \cos\theta = \text{even multiple of } \lambda/2$$

$$2\mu t \cos\theta = 2m \cdot \frac{\lambda}{2} = m\lambda$$

11. Classification of fringes

Equation of the fringe (dark) is

$$2\mu t\cos\theta = m\lambda$$

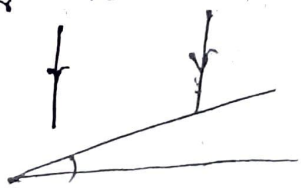
For monochromatic light

λ = constant, μ = constant.

No.	Constant	Variable	Name of the fringe
1	t	θ	Fringe of equal thickness (Fizeau fringe)
2	θ	t	Fringe of equal inclination (Haidinger fringe)

12. Interference in wedge film

With air film and for normal incidence,



$$2t = m\lambda$$

$$t = m \cdot \lambda/2, \quad m = 0, 1, 2, \ldots$$

$t \Rightarrow 0, \lambda/2, \lambda, 3\lambda/2, \ldots$

Dark and straight (parallel to the