Section 2 :-

Q1. Resolving power :→

→ defined as the Ratio of wavelength (λ) of any spectral lines to the smallest difference of two wavelength ($d\lambda$), for which the spectral lines can be resolved at wavelength λ.

Expression

→ Let a light consisting of 2 wavelength λ_1 & λ_2 is incident normally on a grating element $(e+d)$ & the spectral lines corresponding to λ_1 & λ_2 are formed on screen P_1 and P_2.

→ These line, just Resolve if they satisfy the Rayleigh's criterion.

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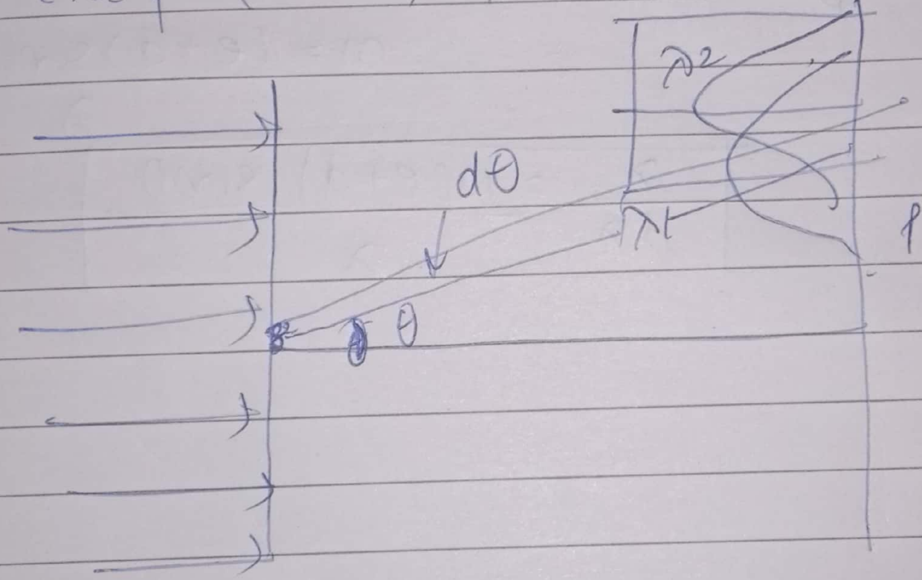
The direction of nth principle maxima for λ_1;

$$(e+d)\sin\theta = n\lambda_1$$
$$N(e+d)\sin\theta = N\{n\lambda_1\} \quad -(1)$$

→ 1st minima in direction $(\theta + d\theta)$ –

$$N(e+d)\sin(\theta + d\theta) = m\lambda_1 \quad (2)$$
except $(m = 0, N, 2N$ or $1, 2, 3 .. N-1)$



when $m = (nN+1)$, eq 2 becomes

$$N(e+d)\sin(\theta + d\theta) = (nN+1)\lambda_1$$

→ The principle maxima due to λ_2 In direction $(\theta + d\theta)$ is.

$$(e+d)\sin(\theta + d\theta) = n\lambda_2.$$
$$N(e+d)\sin(\theta + d\theta) = Nn\lambda_2 \quad -(4)$$

Comparing 3 & 4

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$(nN+1)\lambda_1 = Nn\lambda_2$

If $\lambda_1 = \lambda$ & $\lambda_2 = \lambda + d\lambda$,

$d\lambda = \lambda_2 - \lambda_1$ becomes

$(nN+1)\lambda = Nn(\lambda + d\lambda)$.

$\lambda = Nn\,d\lambda$ OR $\dfrac{\lambda}{\partial\lambda} = nN$

But $(e+d)\sin\theta = n\lambda$ or

$n = \dfrac{(e+d)\sin\theta}{\lambda}$

$$\boxed{\frac{\lambda}{d\lambda} = \frac{N(e+d)\sin\theta}{\lambda}}$$