Q- Light of wavelength 602.446 nm is used in a Michelson interferometer. When the mirror M_2 is slowly moved, shifting of 33198 bright fringes is observed. By what distance mirror M_2 is moved?

In Michelson interferometer when the mirror M2 is displaced the path difference between the two rays reaching the eye changes.

The maxima will be observed when the path difference between the rays from M1 and M2 is equal to integral multiple of wavelength λ, i.e.

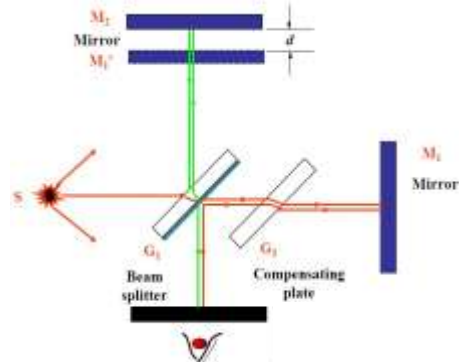$\delta = n \lambda$

If the mirror M2 is displaced by d, the path difference between the beams changes by 2d. As the shift of one fringe (maximum to maximum) corresponds to a path difference of λ and hence the path difference corresponding to 33198 fringe shift will be 33198* λ. hence

$2d = 33198*\lambda$

Or $d = 33198 *\lambda /2 = 16599*602.446*10^{-9}$ m

Or $d = 0.010000$ m