

## MUSTAQIL ISHLASH UCHUN MASALALAR YECHIMLARI

1-masala yechimi —  $d$  ni topish

$$\Delta x = \lambda \cdot L / d \rightarrow d = \lambda \cdot L / \Delta x.$$

$$\Delta x = 2,50 \cdot 10^{-3} \text{ m}$$

$$\lambda = 5,00 \cdot 10^{-7} \text{ m}$$

$$L = 1,80 \text{ m}$$

$$d = (5,00 \cdot 10^7 \cdot 1,80) / (2,50 \cdot 10^3) = 9,00 \cdot 10^7 / 2,50 \cdot 10^3 = 3,6 \cdot 10^4 \text{ m} \\ = 0,360 \text{ mm}$$

Javob:  $d = 0,360 \text{ mm}$

2-masala yechimi —  $\lambda_1$  maksimumi  $\lambda_2$  minimumi bilan mos joy

$$\text{Maksimum: } x = m_1 \cdot \lambda_1 \cdot L / d$$

Minimum:

$$x = (m_2 + 1/2) \cdot \lambda_2 \cdot L / d$$

Tenglashtiramiz:

$$m_1 \cdot \lambda_1 = (m_2 + 1/2) \cdot \lambda_2$$

$$\lambda_1 = 500 \text{ nm}, \lambda_2 = 600 \text{ nm} \text{ qo'yamiz:}$$

$$m_1 \cdot 500 = (m_2 + 1/2) \cdot 600$$

$$\rightarrow 1000 \cdot m_1 = 600 \cdot (2m_2 + 1)$$

$$\rightarrow 5 m_1 = 6 m_2 + 3$$

Eng kichik musbat yechim:

$$m_1 = 3, m_2 = 2$$

$$x = m_1 \cdot \lambda_1 \cdot L / d = 3 \cdot 500 \cdot 10^9 / (2,00 \cdot 10^4) = 1,5 \cdot 10^6 / 2 \cdot 10^4 \\ = 7,5 \cdot 10^3 \text{ m} \\ = 7,5 \text{ mm}$$

Javob:  $x = 7,5 \text{ mm}$

3-masala yechimi — havo pufagi tasma oraliq'i

$$\text{Havo pufagi: } t(x) = \alpha \cdot x$$

$$\text{Reflektiv konstruktiv shart: } 2 \cdot t = m \cdot \lambda$$

Yonma-yon tasmalar orasidagi masofa:

$$\Delta x = \lambda / (2 \cdot \alpha)$$

$$\Delta x = 6,00 \cdot 10^7 / (2 \cdot 10^4) = 6 \cdot 10^7 / 2 \cdot 10^4 = 3 \cdot 10^3 \text{ m} = 3,0 \text{ mm}$$

Javob:  $\Delta x = 3,0 \text{ mm}$

4-masala yechimi — Nyuton halqasining radiusi

Nyuton halqalari (qorongʻi halqa) uchun formula:

$$r^2 = m \cdot \lambda \cdot R$$

$$m = 5$$

$$\lambda = 589 \text{ nm} = 5,89 \cdot 10^7 \text{ m}$$

$$R = 1 \text{ m}$$

$$r = \sqrt{5 \cdot 5,89 \cdot 10^7} = \sqrt{2,945 \cdot 10^6} \approx 1,716 \cdot 10^3 \text{ m} = 1,716 \text{ mm}$$

Javob:  $r \approx 1,716 \text{ mm}$

5-masala yechimi

$$N = (2 \cdot \Delta) / \lambda = 1,80 \cdot 10^6 / 6,328 \cdot 10^7 \approx 2,844$$

Demak 2 ta toʻliq tasma va yana 0,844 qismi siljiydi.

Javob:  $N \approx 2,844$  frinji (2 tasi toʻliq)

6-masala yechimi — markaziy maksimum kengligi

$$\Delta x = 2 \cdot L \cdot \lambda / b$$

$$b = 1 \cdot 10^4 \text{ m}$$

$$\lambda = 5 \cdot 10^7 \text{ m}$$

$$L = 1,20 \text{ m}$$

$$\Delta x = 2 \cdot 1,20 \cdot 5 \cdot 10^7 / 10^4 = 1,2 \cdot 10^6 / 10^4 = 1,2 \cdot 10^2 \text{ m} = 12,0 \text{ mm}$$

Javob:  $\Delta x = 12 \text{ mm}$

7-masala yechimi — panjara ajratish qobiliyati

Zichlik 1200 chiziq/mm, kenglik 8 mm → yoritilgan chiziqlar soni:

$$N = 1200 \cdot 8 = 9600$$

Ajratish qobiliyati:

$$R = m \cdot N$$

$$R = 1 \cdot 9600 = 9600$$

Javob:  $R = 9600$

8-masala yechimi — pufakning eng kichik qalinligi

Aks etishda yorug' bo'lishi uchun (bitta faza burilishi mavjud):

$$2 \cdot n \cdot d = (m + 1/2) \cdot \lambda$$

Eng kichigi  $m = 0$ :

$$d = \lambda / (4 \cdot n)$$

$$d = 550 \cdot 10^9 / (4 \cdot 1,33) = 550 \cdot 10^9 / 5,32 \approx 1,03 \cdot 10^7 \text{ m} = 103 \text{ nm}$$

Javob:  $d \approx 103 \text{ nm}$

9-masala yechimi — polarizator + QWP + analizator

1. Qutblanmagan yorug'lik  $\rightarrow$  polarizatoridan keyin:

$$I_1 = I_0 / 2 = 6,0 \text{ W/m}^2$$

2. Polarizatorga nisbatan  $45^\circ$  burilgan QWP  $\rightarrow$  chiziqli nurni aylana qutblanishga aylantiradi.

Aylana qutblangan nur analizator orqali burchakka bog'liq bo'lmay:

$$I_2 = I_1 / 2$$

$$I_2 = 6,0 / 2 = 3,0 \text{ W/m}^2$$

Javob:  $I = 3,0 \text{ W/m}^2$

10-masala yechimi

$$2 \cdot \Delta \leq L_c \rightarrow \Delta \leq L_c / 2$$

$$L_c = 0,30 \text{ mm} = 3 \cdot 10^4 \text{ m}$$

$$\Delta_{max} = 3 \cdot 10^4 / 2 = 1,5 \cdot 10^4 \text{ m} = 0,150 \text{ mm} = 150 \mu\text{m}$$

Javob: Maksimal siljitish  $\Delta = 150 \mu\text{m}$