پاسخ نامه تشریحی ریاضی ۱۴۰۰ — زیبا حضرا

داوری

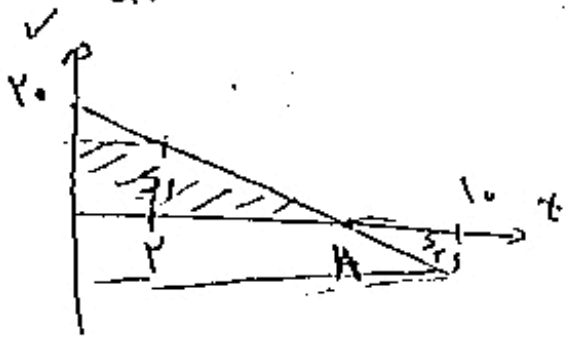
۰۹۱۷۷۷۵۲۴۹۰

۱۵۶ — (۱)

۱۵۷ — (۲)

$\frac{\text{کار}}{\text{ثانیه}} = \frac{۷۲۰}{۲} = ۶$

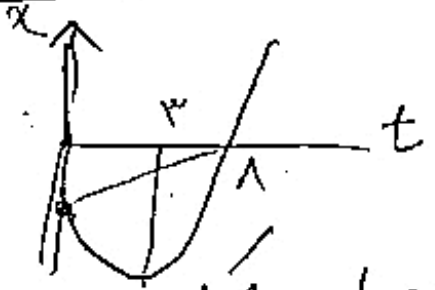
۱۵۸ — (۴)



$S_1 + S_2 = ۸۵ \Rightarrow S_1 = ۸۰ ,\ S_2 = ۵ \rightarrow$

$S_1 - S_2 = ۷۵$

$\frac{۲۰}{۸} = \frac{۱۵}{۶} \rightarrow v = ۱۵ ,\ l = \frac{۲۰+۱۵}{۲} \times ۲ = ۳۵$



۱۵۹ — (۳)

$v_۳ = ۰$

$v_۳ = at + v_۰ \Rightarrow ۳a + v_۰ = ۰$

$v_۰ = -۳a ,\ v_۸ = at + v_۰ = ۸a + v_۰ = ۵a$

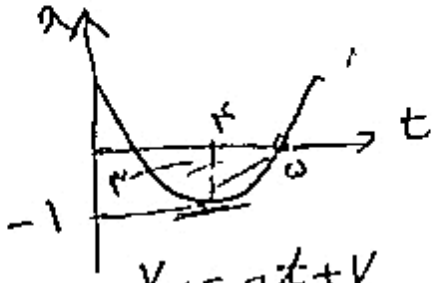
$\Delta x = \frac{۱}{۲}(v_۰ + v_۸)t = \frac{۱}{۲}(v_۰ + ۵a)(۸) = \frac{۱}{۲}(۲a)۸ = ۸a$

$\Delta x_{۱}^{۰-۳} = \frac{۱}{۲}(v_۰ + v_۳)t = \frac{۱}{۲}(-۳a + ۰)(۳) = -\frac{۹}{۲}a$

$\Delta x_۲ = \frac{۱}{۲}(v_۳ + v_۸)(۵) = \frac{۱}{۲}(۵a)(۵) = \frac{۲۵}{۲}a$

$l = |\Delta x_۱| + |\Delta x_۲| = (\frac{۹}{۲} + \frac{۲۵}{۲})a = \frac{۳۴}{۲}a = ۱۷a$

$\frac{\Delta x}{l} = \frac{۸}{۱۷}$



$V_4 > 0$

$4a + V_0 = 0 \rightarrow V_0 = -4a$

$\Delta x = \frac{1}{2}(V_0 + V_3)t \Rightarrow -1 = \frac{1}{2}(V$

$V_3 = at + V_0$

$V_3 = 3a - 3a = -a$

$\Delta x = \frac{1}{2}(V_3 + V_4)(1)$

$-1 = \frac{1}{2}(-a)(1) \rightarrow a = 2$

$V_3 = -2 \; , \; V_0 = 2$

$V_0 = -8$

$\Delta x_1 = \frac{1}{2}(V_0 + V_3)(4) = \frac{1}{2}(-2-8)(4)$

$= -20$

$l = |\Delta x_1| + |\Delta x_2| + |\Delta x_3| = 17$

$S_{av} = \frac{L}{\Delta t} = \frac{17}{5}$

(۳) - 140

$F_e = kx \rightarrow 30 = \frac{4}{100}k \rightarrow k = \frac{3000}{4}$

(۴) - 141

$k = 750 \, N/m$

$F - F_k = ma$

$\Delta x_1 = \frac{1}{2}(V_0 + V_1)t$

(۴) - 142

$\frac{1}{2}F - \frac{1}{2}\mu mg = \frac{1}{2}ma_1 \rightarrow a_1 = 1 \quad \Delta x_1 = \frac{1}{2}at^2 = \frac{1}{2}(1)(2)^2 = 2$

$F - F_k = ma_2 \Rightarrow a_2 = -\mu g = -2$

$V_2^2 - V_1^2 = 2a_2 \Delta x_2$

$-4 = 2(-2)\Delta x_2 \rightarrow \Delta x_2 = 1 (m)$

$V = at + V_0$

$= 2$

$l = 2 + 1 = 3 (m)$

$F_1 - mg = -ma \Rightarrow F_2 - F_1 = 10a \rightarrow l_2 - l_1 = 0.1$

(۲) - 143

$F_2 - mg = ma$

$k(L_2 - L_1) = 10a$

$V = 10\pi$ $\quad r = 20\,m$ $\quad q_r = ?$ $\quad \lambda = 1$ $\quad$ ① ـ ۱۹۴

$$q_r = \frac{V^2}{r} = \frac{100\pi^2}{20} = 5\pi^2$$

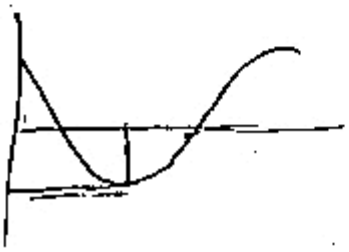
$$\Delta r = 2A_1 \sin\frac{\varphi}{2} = 2\times 10\pi \sin 45 = 10\pi\sqrt{2}$$

$$T = \frac{2\pi r}{V} \quad q_{av} = \frac{10\pi\sqrt{2}}{1} \;,\; \frac{1/\pi\sqrt{2}}{0/1} = \frac{2\sqrt{2}}{\pi}$$

$x = 0/2\cos\frac{\pi}{2}t$ ، $T = \frac{2\pi}{\omega} = \frac{2\pi}{\frac{\pi}{2}} = 4$ ② ـ ۱۹۵

$$\Delta t = \frac{25}{12} - \frac{1}{12} = 2$$

$$\frac{\Delta t}{T} = \frac{2}{4} = \frac{1}{2} \rightarrow \Delta t = \frac{T}{2}$$

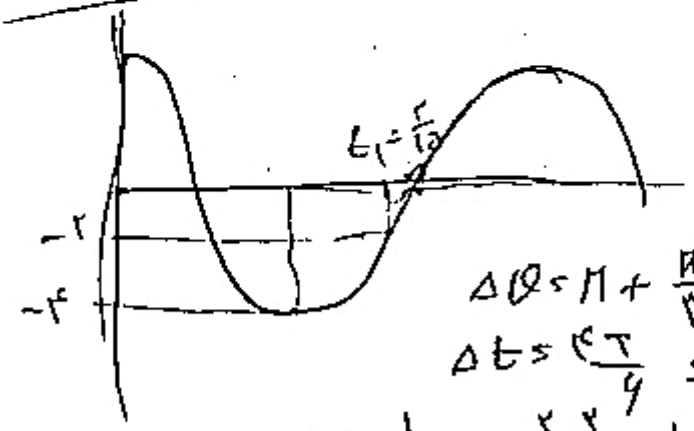


$$S_{av} = \frac{L}{\Delta t} = \frac{2A}{2} = \frac{2\times 0/2}{2} = 2$$

$$\Delta t = \frac{9}{400}\,\frac{3\lambda}{2} = 30 \rightarrow \lambda = 20/3$$

$$f = \frac{\lambda}{V} = \frac{20/3}{10} = 0/2 = \frac{8}{400}$$

$$\Delta t = \frac{8}{400} + \frac{1}{400} \qquad 0 < t_1 < \frac{T}{2}$$



$$E\cos\theta = \frac{2}{4} = \frac{1}{2} \quad$$ ② ـ ۱۹۷

$$\theta = \frac{\pi}{3}$$

در ربع سوم قرار دارد

$$\Delta\theta = \pi + \frac{\pi}{3} = \frac{4\pi}{3}$$

$$\Delta t = \frac{4T}{4} = \frac{2}{10} = \frac{4T}{4} \rightarrow T = 5$$

$$E = \frac{1}{2} m\omega^2 A^2 = \frac{1}{2}\times 5\times 10^{-2}\times\left(\frac{2\pi}{5}\right)^2 (4\times 10^{-2})^2 = \frac{1}{25}$$

(۱) - ۱۴۸

$$B_1 - B_2 = 10 \log \frac{I_2}{I_1}$$

$$92 - 28 = 10 \log \frac{I_2}{I_1} \rightarrow 64 = 10 \log \frac{I_2}{I_1}$$

$$\log \frac{I_2}{I_1} = 6.4 = 7 - (2 \times 0.3) = \log 10^7 - 2 \log 2$$

$$\log \frac{I_2}{I_1} = \log 10^7 - \log 2^2 \rightarrow \log \frac{I_2}{I_1} = \log \frac{10^7}{4}$$

$$\frac{I_2}{I_1} = 2.10 \times 10^6$$

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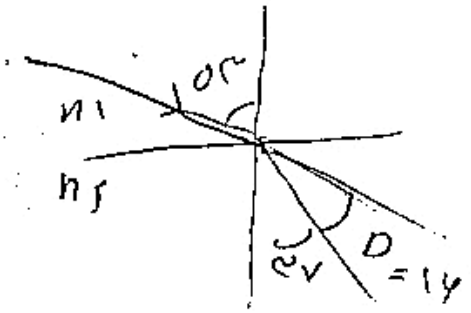
(۲) - ۱۴۹

$$F_1 + F_2 = 375 \rightarrow F_1 + 2F_1 = 375 \rightarrow F_1 = 125$$

$$F_1 = \frac{V}{2L} \Rightarrow V = 2FL = 100$$

$$V = \sqrt{\frac{F}{\mu}} \rightarrow F = \mu V^2 = \frac{m}{L} V^2 = \frac{1.1 \times 10^{-2}}{1.1} (10000) = 250$$



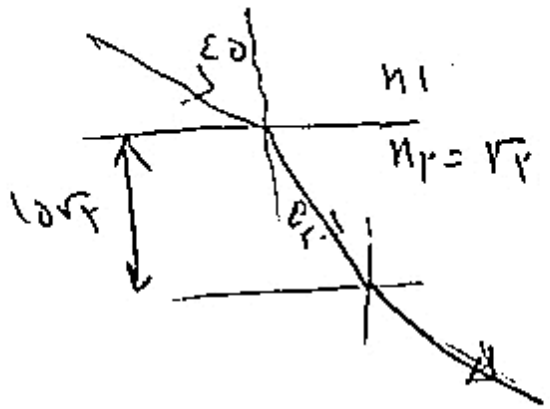
$$\frac{n_2}{n_1} = \frac{\sin\theta_1}{\sin\theta_2} = \frac{V_1}{V_2} = \frac{\lambda_1}{\lambda_2}$$ ۱۷۰

$$\lambda_2 = \lambda - \frac{1}{8} \quad (1)$$

$$\frac{\sin\theta_2}{\sin\theta_1} = \frac{V_2}{V_1} = \frac{\lambda_2}{\lambda_1}$$

$$\frac{\lambda_2}{\lambda_1} = \frac{\sin 45}{\sin 30} \Rightarrow \lambda_2 = \frac{3}{4}\lambda_1 \quad (2)$$

$$\rightarrow \lambda_1 = \frac{1}{2}, \quad f = \frac{c}{\lambda} \Rightarrow f = 4 \times 10^{14}$$



$n_1 \sin\theta_1 = n_2 \sin\theta_2$

$\sin 45 = \sqrt{2} \sin\theta_2$

$\sin\theta_2 = \frac{1}{2} \Rightarrow \theta_2 = \frac{\pi}{4}$

$\frac{v_1}{v_2} = \frac{\sin\theta_1}{\sin\theta_2} \rightarrow \frac{3\times10^8}{v_2} = \frac{\frac{\sqrt{2}}{2}}{\frac{1}{2}}$

$v_2 = 3\times10^8 \frac{\sqrt{2}}{2}$

$\cos\theta_2 = \frac{10\sqrt{2}}{AB}$

$AB - 20\,cm = y^0$

$\Delta x = v t \Rightarrow t = \frac{\Delta x}{v} = \frac{y\sqrt{2}}{3\sqrt{2}\times10^8} = \sqrt{2}\,ns$

(۳) - ۱۷۱

$f_0 = \frac{5}{8}\times10^{15}$

$E = 4.15\times10^{-19}\,J$

$K = kp - w_0$

$K_0 = kp_0 - w_0$

$K = \frac{1}{2}mv^2 \rightarrow v = \sqrt{\frac{2K}{m}}$

(۲) ۱۷۲

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(۴) - ۱۷۳

$\frac{1}{\lambda_{max}} = R_H\left(\frac{1}{3^2} - \frac{1}{\infty^2}\right) = \frac{1}{10}\left(\frac{1}{9} - \frac{1}{\infty}\right) = \frac{1}{10}\times\frac{5}{36}$

$\lambda_m = \frac{36}{5} = 720\,nm$

$720 - 500 = 220$

$\lambda_{min} = \frac{4}{R_H} = 500\,nm$

(۲) گزینه

$E_n = -\frac{E_R}{n^2} = -\frac{13.6}{12} = -13.6\times10^{-19}$

$\Delta E = E_1 - E_2 = E_R\left(\frac{1}{12} - \frac{1}{4}\right) = 1.36\times10^{-18}$

(۱) - ۱۷۵

(۳) ـ ۱۷۶

$N = \frac{N_0}{2^n}$ $\quad \frac{2^{29}\times 2^{20}}{5\times 2^{30}} = 4$

$\frac{N}{N_0}\times 100 \Rightarrow \frac{1}{2^4}\times 100 = \frac{1}{16}\times 100 = \%6.25$

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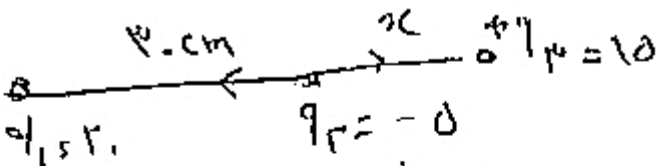
(۴) ـ ۱۷۷



$\frac{k\cdot q_3 q_1}{(30+x)^2} = \frac{k\cdot q_2 q_3}{x^2} \Rightarrow \frac{20}{(30+x)^2} = \frac{5}{x^2} \Rightarrow 30+x = 2x$

$x = 30$ cm

$F_1 = \frac{9\times 10^9 \times 20\times 5}{900} - \frac{9\times 10^9 \times 5\times 10}{900} = \frac{q_1 \times 5}{9\times 10^9}(5) = 25$ N

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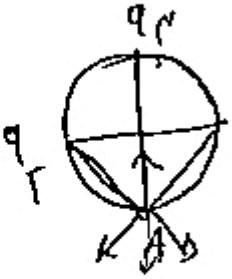
(۴) ـ ۱۷۸



$E_{12} = \sqrt{2}E_1 = \sqrt{2}\frac{k q_1}{2r^2}$

$\sqrt{2}\frac{k q_1}{2r^2} = \frac{k q_3}{4r^2} \rightarrow q_3 = 2\sqrt{2}$

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(۴) ـ ۱۷۹

$\frac{\sigma_2}{\sigma_1} = \frac{q_2}{q_1} = \frac{8}{20}$

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(۳) ـ ۱۸۰

$\sigma = \frac{q}{A} = \frac{q}{4\pi r^2} = \frac{8}{4\times 3\times 25\times 10^{-4}} = \frac{20}{3}\times 10^2$

$q'_A = q'_B = \frac{q_A + q_B}{2} = \frac{20-4}{2} = 8\mu C$, $\sigma'_A = \frac{8}{3\times 10^{-2}}$

$\sigma_A - \sigma'_A = \left(\frac{20}{3} - \frac{8}{3}\right)\times 10^2 = 40$

۱۱۱ - ۱

$\Delta U = \frac{1}{2C}(q_2^2 - q_1^2) \Rightarrow \epsilon_{15} = \frac{1}{2\times 5\times 10^{-6}}\left((q+3)^2 - q^2\right)\times 10^{-6}$

$45 \times 10^{-6} = (q^2+6q+9-q^2)\times 10^{-6}$

$45 = 6q \rightarrow q = 7.5$

۱۱۲ - ۲

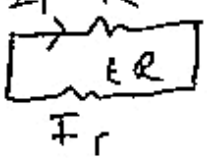
۱۱۳ - ۱

$V_2 = \mathcal{E}_2 + I r_2 \Rightarrow 4.5 = 4 + I \Rightarrow I = 0.5$

$R_{12} = \frac{R\times 5R}{6R} = \frac{5}{6}R$ $\quad 0.5 I = \frac{6}{\frac{5}{6}R+2} \rightarrow \frac{5}{6}R+2 = 12$ $\quad R = 12$

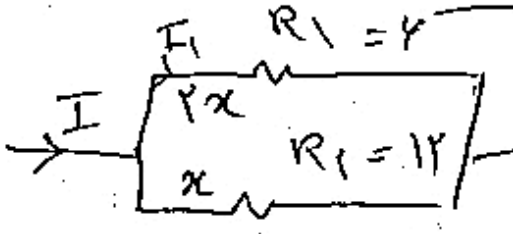
$I = I_1 + I_2$, $I_1 = 5 I_2$, $I = 6 I_2$, $I_1 = \frac{5}{6} I$

$P = R I^2 = 12 \times \frac{5^2}{12} = 12.5\ (W)$



۱۱۴ - ۲

۱۱۵ - ۳



$x + 2x = I$

$3x = I \rightarrow x = \frac{I}{3}$

$I_1 = \frac{2}{3} I$

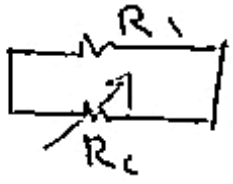
$P_2 = 4 P_1 \rightarrow R_2 I_2^2 = 4 I_1^2 R_1$

$R_2 \times I^2 = 4 \left(\frac{I}{3}\right)^2 \Rightarrow R_2 = 8\ \Omega$

$V = \mathcal{E} - Ir$ (۴) ـ ۱۸۶

$V_1 = \mathcal{E} - I_1 r \;,\; V_2 = \mathcal{E} - I_2 r$

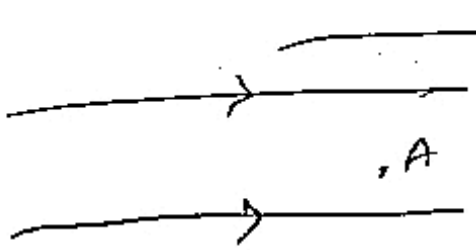
$R_T = \dfrac{R_1 \times R_2}{R_1 + R_2}$



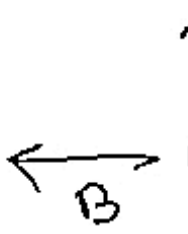
$I = \dfrac{\mathcal{E}}{R_T + r}$

$qVB = ma \Rightarrow a = \dfrac{qVB}{m} \Rightarrow B = \dfrac{ma}{qV}$ (۱) ـ ۱۸۷

$B = \dfrac{۴/۹۸ \times ۱۰^{-۲۷} \times ۴ \times ۱۰^{۵}}{۵۰ \times ۱/۶ \times ۱۰^{-۱۹}} = ۱/۹۷ \times ۱۰^{-۴} = ۱/۹۷\ G$



(۴) ـ ۱۸۸



$F = qE$ (۱) ـ ۱۸۹

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(۴) ـ ۱۹۰ چون جریان در حال کاهش است طبق قانون لنز

$\downarrow I = \dfrac{\mathcal{E}}{R\uparrow}$

$\Phi = BA\cos\theta$ در هر دو حالت گزینه ۴ صحیح میباشد

$\mathcal{E} = -\dfrac{\Delta\Phi}{\Delta t}$

$B = \frac{\mu N I}{L}$ $L_A = 2L_B$ ② - 191

$L = \frac{1}{2} \frac{\mu N^2 A}{L}$ $N_A = 2N_B$

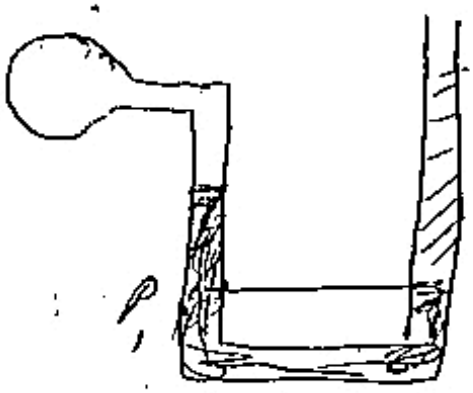
$U = \frac{1}{2} L I^2$, $\frac{U_2}{U_1} = \frac{L_2}{L_1} = 2$

$\frac{B_A}{B_B} = \frac{N_A^2}{N_B} \times \frac{L_B}{L_A} = 1$

$W = -mgh = 4.0 \times 10^{-3} \times 10 \times 400 = -1.6 \times 10^{-1} \hat{j}$ ④ 192

$E_2 - E_1 = (K_2 + U_2) - (K_1 + U_1) = \left(\frac{1}{2}mv^2 + mgh\right) - \frac{1}{2}mv^2$

$= 9.2 \times 10^{-1} \hat{j}$



$P_0 + \rho_2 h_2 g = P_g + \rho_1 h_1 g$ ① - 192

$P_0 + 1000 \times 9 = P_g + 4000$

$P_g - P_0 = 5000$

$P_1 = P_0 + \rho h_1 g \Rightarrow P_2 - P_1 = \rho(h_2 - h_1)g$ ③ - 196

$P_2 = P_0 + \rho_1 h_2 g$

$4000 = \rho \times 10 \times 10$

$\rho = \frac{4000}{10} = 400$

$P_1 = P_0 + \rho h g \Rightarrow P_0 = 1000 - 400 \times 50 \times 10^{-2}$

$P_0 = 98\ kP$

(۴) _ ۱۹۵

$Q = mL_f + mc\Delta\theta$

$\theta_F = 1.8\theta + 32 \rightarrow \theta = 10$

$= ۰/۲ \times ۳۳۶۰۰۰ + ۰/۲ \times ۴۲۰۰ \times ۲۰ =$ ۷۵۶ ژ

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(۲) _ ۱۹۶

$H = \dfrac{kA\Delta\theta}{L}$

$K = \dfrac{T_L}{T_H - T_L} = \dfrac{۳۰۰}{۴۰۰ - ۳۰۰} = ۳$ (۳) _ ۱۹۷

$PV = nRT$

(۱) _ ۱۹۸

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۳ _ ۱۹۹

$\dfrac{P_1V_1}{T_1} = \dfrac{P_2V_2}{T_2}$ $P_1 = P_0 + \rho gh = ۵\times10^4 + 10^5$

$P_2 = P_0 + \rho gh = 10^5 + 10^5 = ۲\times10^5$

$\dfrac{۱۵\times10^4 \times ۴V_1}{T_1} = \dfrac{۲\times10^5 \times ۲V_1}{T_2}$ و $\dfrac{T_2}{T_1} = \dfrac{۸}{۳}$ گزینه (۳) صحیح می‌باشد

$\dfrac{U_2}{U_1} = \dfrac{T_2}{T_1} \Rightarrow U_2 = ۱۶۰۰$

$U_1 = ۱۸۰۰$

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(۳) _ ۲۰۰

زارعی ۰۹۱۷۷۶۵۲۴۹۰

موفق باشید