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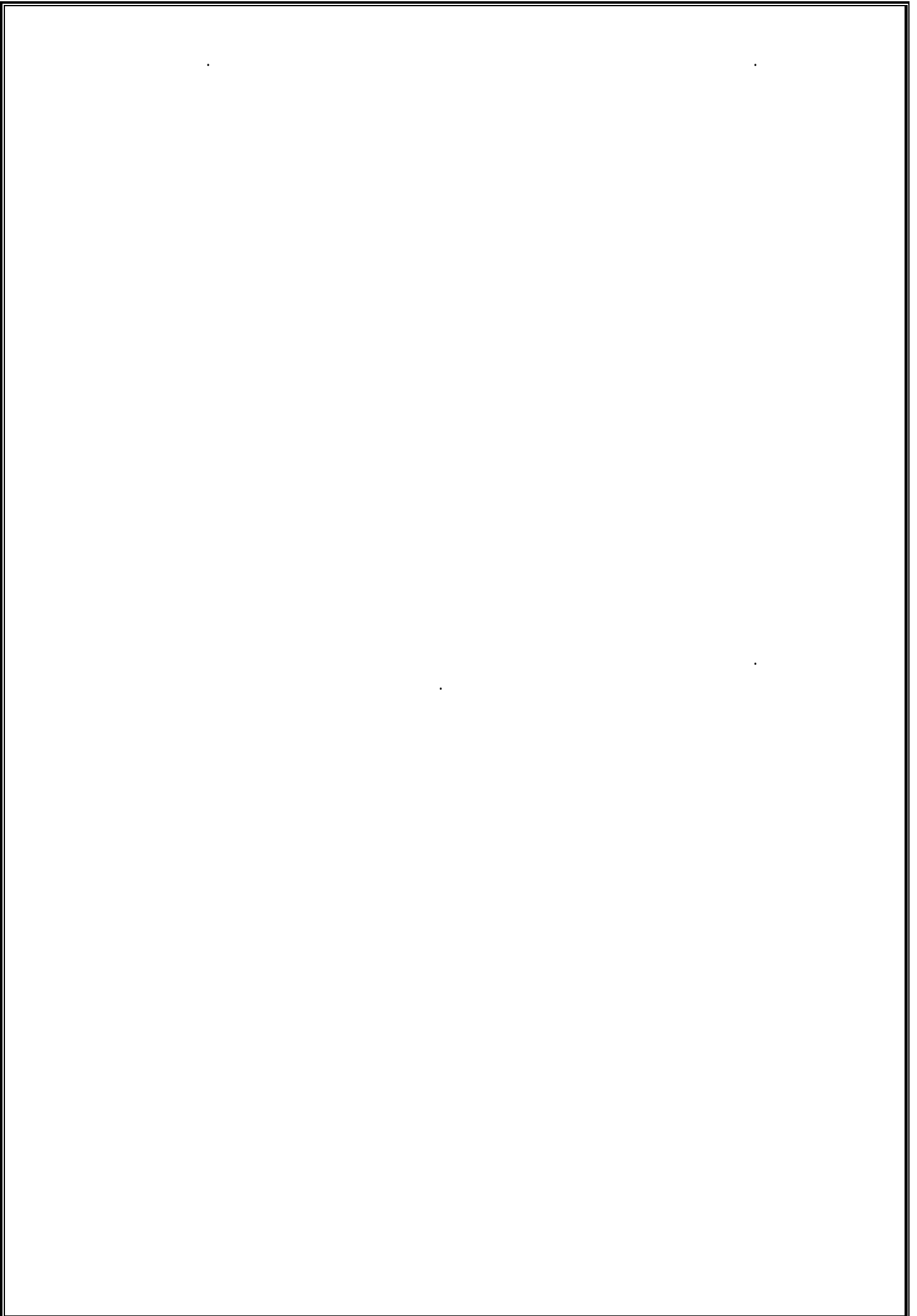
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$$X = 2.74 T_a^{0.5}$$

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= Y , X

$$Y = 0.5 T_a^{0.8} = T_a :$$

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$$V_t = S_c \times S_b \times Z = 1.5 \times 2.0 \times 0.75 = 2.25 \text{ m}^3$$

$$V_w = P_w \times V_t = 0.35 \times 2.25 = 0.7875 \text{ m}^3$$



$$n = 6 \quad S_o = 50 \text{ cm} \quad q_o = 4 \text{ L/hr / m}$$

$$H_i = 8 \text{ m} \quad C_{d_o} = C_{d_i} = 0.75 \quad d_i = ? \quad H_o = ?$$

$$d = 0.38 \text{ mm} \quad \text{دiameter} \quad H = ?$$

اولاً: التفويت في الجريان

$$\therefore H_o = \frac{H_i}{n^2 + 1} = \frac{8}{6^2 + 1} = \frac{8}{37} = 0.216 \text{ m}$$

$$q_o = \frac{4 \text{ L/hr} \times 0.5 \text{ m}}{1} = 2 \text{ L/hr}$$

$$\therefore 2 = 3.6 \times 0.75 \times \frac{\pi}{4} d_o^2 \sqrt{2 \times 9.81 \times 0.216}$$

$$\therefore d_o = 0.677 \text{ mm}$$

$$d_i = d_o = 0.677 \text{ mm}$$

ثانياً: المنفذ الدائري

$$q_o = 3.6 \times 0.4 \times \frac{\pi}{4} d^2 \sqrt{2g} H^{0.4}$$

$$\therefore 2 = 3.6 \times 0.4 \times \frac{\pi}{4} (0.38)^2 \sqrt{2 \times 9.81} \times H^{0.4}$$

$$H^{0.4} = 0.6238$$

$$H = \underline{12.7 \text{ m}}$$

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assume  $t_a = 15$  hr

$$V_p = q_e \times N_p \times t_a$$
$$225 = 4 \times N_p \times 15$$

$$\therefore N_p = 3.75 = \underline{4}$$

$$\therefore t_{aa} = \frac{225}{4 \times 4} = 14.06 \text{ hr} \quad \text{OK } 12 \leq t_a < 15$$

$$Q_L = N_{tree} \times N_p \times q_e = 50 \times 4 \times 4 = 800 \text{ L/hr} = 0.222 \text{ L/s}$$

$$\Delta H_L = 0.55 \times 6 = 3.3 \text{ m}$$

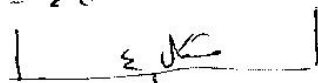
$$L = 50 \times 4 = 200 \text{ m}$$

$$\therefore 3.3 = H_f - \frac{L}{100} \times 200 \quad \therefore H_f = 5.3 \text{ m}$$

$$5.3 = 3.98 \times 10^5 \times 200 \times \frac{(0.222)^{1.852}}{D^{4.871}}$$

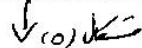
$$\therefore D = \underline{16.7} \text{ mm}$$

$$\frac{L}{H_f} = \frac{200}{10} = 20 \quad S = 1\% \downarrow$$



$$\frac{\Delta H}{L} = 21$$

$$Q = 0.222 \text{ L/s}$$



$$D = 1.7 \text{ cm} = 17 \text{ mm}$$

Final

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(B)

(Cp)

$$B = 0.6$$

$$C_p = 0.05$$

$$N_p = 3$$

رقم المذخر	الحجم المجموع $X_i$	الفرق المتوسط $ X_i - \bar{X} $	مربع الفرق المتوسط $ X_i - \bar{X} ^2$	ترتيب الحجم تصاعدي
1	340	5	25	280
2	360	25	625	290
3	375	40	1600	300
4	320	15	225	310
5	335	سز	سز	315
6	370	35	1225	320
7	310	25	625	330
8	315	20	400	335
9	355	20	400	340
10	345	10	100	345
11	380	45	2025	355
12	330	5	25	355
13	280	55	3025	360
14	290	45	2025	370
15	355	20	400	375
16	300	35	1225	380
$\Sigma$	5360		13950	

$$q_a = \bar{X} = \frac{\Sigma X_i}{n} = \frac{5360}{16} = 335$$

$$S_d = \sqrt{\frac{\Sigma |X_i - \bar{X}|^2}{n-1}} = \sqrt{\frac{1390}{16-1}} = 30.5$$

$$C_v = \frac{S_d}{q_a} = \frac{30.5}{335} = 0.091$$

$$U_s = (1 - C_v) \times 100 = (1 - 0.091) \times 100 = 90.9\%$$

$$q_n = \frac{280 + 290 + 300 + 310}{4} = 295$$

$$q_m = \frac{380 + 375}{2} = 377.5$$

$$H_{var} = \frac{q_m - q_n}{q_m} \times 100 = \frac{377.5 - 295}{377.5} \times 100 = 21.9\%$$

$$H_{var} = (1 - (1 - H_{var})^B) \times 100$$

$$0.219 = 1 - (1 - H_{var})^6$$

$$\therefore H_{var} = 0.337 = 33.7\%$$

$$(Eu)_f = \frac{q_n}{q_a} \times 100 = \frac{295}{335} \times 100 = 88.06\%$$

$$(Eu)_d = \left(1 - \frac{1.276}{\sqrt{N_p}}\right) \times \frac{q_n}{q_a} \times 100$$
$$= \left(1 - \frac{1.27 \times 0.091}{\sqrt{3}}\right) \times \frac{295}{335} \times 100 = 82.18\%$$

$$(Eu)_a = \frac{1}{2} \left(\frac{q_n}{q_a} + \frac{q_a}{q_m}\right) \times 100$$
$$= \frac{1}{2} \left(\frac{295}{335} + \frac{335}{377.5}\right) \times 100 = 88.4\%$$

$$C_{hh} = \frac{C_v}{B} = \frac{0.091}{0.6} = 0.152$$

$$(U_s)_h = (1 - C_{hh}) \times 100$$
$$= (1 - 0.152) \times 100 = 84.8\%$$

$$C_{hp} = \sqrt{C_v^2 + C_p^2}$$
$$= \sqrt{(0.091)^2 + (0.05)^2} = 0.104$$

$$(U_s)_p = (1 - C_{hp}) \times 100$$
$$= (1 - 0.104) \times 100 = 89.6\%$$

$$C_{ht} = \sqrt{C_{hp}^2 + C_{hh}^2}$$
$$= \sqrt{(0.104)^2 + (0.152)^2} = 0.184$$

$$(U_s)_t = (1 - C_{ht}) \times 100$$
$$= (1 - 0.184) \times 100 = 81.6\%$$



