?
?
q
$V(q)$
??
$_functions.png$

$$L = \frac{1}{\sqrt{2}}(0{-}1), R = \frac{1}{\sqrt{2}}(0{+}1).$$

(1)
??
$_functions_sum.png$

$$H = -\frac{1}{2}\hbar\Delta_0\sigma_x + \frac{1}{2}\epsilon\sigma_z,$$

(2)
$\hbar\Delta_0$
ϵ
$\sigma_i(i =$
$x, y, z)$
?
$\sigma_z\hat{\Omega}$
$\hat{\Omega}$
σ_z
σ_z
$J(\omega)$

$$H(p, x; \mathbf{P,X}) = H_S + H_B + H_{SB}$$

(3)
(S)
m

$$H_S = \frac{p^2}{2m} - a\frac{x^2}{2} + b\frac{x^4}{4},$$

(4)
p
q
a, b
(B)

$$H_B(\mathbf{P,X}) = \sum_{n=1}^{N}\left(\frac{P_n^2}{2M_n} + M_n\omega_n^2\frac{X_n^2}{2}\right),$$

(5)
n
X_n
P_N
ω_n
M_n

$$H_{SB}(p, x; \mathbf{P,X}) = -x\sum_{n=1}^{N} g_n X_n + x^2\sum_{n=1}^{N}\frac{g_n^2}{2M_n\omega_n}$$

(6)
?

$$\dot{p} = \frac{-\partial H}{\partial x} = ax - bx^3 + \sum_{n=1}^{N} g_n X_n - x\sum_{n=1}^{N}\frac{g_n^2}{M_n\omega_n^2},$$

(7)

$$\dot{x} = \frac{\partial H}{\partial p} = \frac{p}{m}.$$

(8)
n

$$\dot{P}_n = \frac{-\partial H}{\partial X_n} = -xg_n - M_n\omega_n^2 X_n$$

(9)

$$\dot{X}_n = \frac{\partial H}{\partial P_n} = \frac{P_n}{M_n}$$

(10)

$$V(x) = -\frac{1}{2}ax^2 + \frac{1}{4}bx^4,$$

(11)
V

$$\frac{d}{dx}V = 0 \rightarrow x(bx^2 - a) = 0.$$

(12)
$x =$
$0, \pm\sqrt{\frac{a}{b}}$
$x =$