9 - 2

(a)

$$E_n^{(1)} = \begin{cases} -V_0 \int_{-\frac{L}{2}}^{0} \frac{1}{L} \cos^2\left(\frac{n\pi x}{2L}\right) dx \; ; & n = 1, 3, 5, \dots \\ -V_0 \int_{-\frac{L}{2}}^{0} \frac{1}{L} \sin^2\left(\frac{n\pi x}{2L}\right) dx \; ; & n = 2, 4, 6, \dots \end{cases}$$

$$\Rightarrow E_n^{(1)} = \begin{cases} -V_0 \left(\frac{1}{4} + \frac{1}{n\pi} \sin\left(\frac{n\pi}{2}\right)\right) ; & n = 1, 3, 5, \dots \\ -V_0 \left(\frac{1}{4} - \frac{1}{n\pi} \sin\left(\frac{n\pi}{2}\right)\right) ; & n = 2, 4, 6, \dots \end{cases}$$

(b)

$$E_n^{(1)} = \begin{cases} V_0 \int_0^{\frac{L}{2}} \frac{1}{L} \cos^2\left(\frac{n\pi x}{2L}\right) dx \; ; & n = 1, 3, 5, \dots \\ V_0 \int_0^{\frac{L}{2}} \frac{1}{L} \sin^2\left(\frac{n\pi x}{2L}\right) dx \; ; & n = 2, 4, 6, \dots \end{cases}$$

$$\Rightarrow E_n^{(1)} = \begin{cases} V_0 \left(\frac{1}{4} + \frac{1}{n\pi}\right) ; & n = 1, 5, 9, \dots \\ V_0 \left(\frac{1}{4} - \frac{1}{n\pi}\right) ; & n = 3, 7, 11, \dots \\ V_0/4 \; ; & n = 2, 4, 6, \dots \end{cases}$$

$n = 1, 5, 9, \dots$; $n = 3, 7, 11, \dots}$; $n = 2, 4, 6, \dots$ } dx

(c)

$$E_n^{(1)} = \begin{cases} -V_0 \int_{-\frac{L}{2}}^{0} \frac{1}{L} \cos^2\left(\frac{n\pi x}{2L}\right) dx + V_0 \int_0^{\frac{L}{2}} \frac{1}{L} \cos^2\left(\frac{n\pi x}{2L}\right) \\ -V_0 \int_{-\frac{L}{2}}^{0} \frac{1}{L} \sin^2\left(\frac{n\pi x}{2L}\right) dx + V_0 \int_0^{\frac{L}{2}} \frac{1}{L} \sin^2\left(\frac{n\pi x}{2L}\right) dx \end{cases}$$

$\Rightarrow E_n^{(1)} = 0 \; ; \; n = 1, 2, 3, \dots$ ($n = 2, 4, 6, \dots$

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