Section 1:

1) $c_m = \frac{1}{T_O}\int_{-0.25ms}^{0.75ms} f(t)e^{-jmw_o t}\,dt$

$$c_m = \frac{1}{T_O}\int_{-0.25ms}^{0.25ms} e^{-jmw_o t}\,dt$$

$$\int_{-0.25ms}^{0.25ms} e^{-jmw_o t}\,dt = \frac{1}{-jmw_o t}e^{-jmw_o t} + C$$

$$c_m = \frac{1}{T_O}\left(\frac{1}{-jmw_o t}\left[e^{-jmw_o(0.25ms)} - e^{-jmw_o(-0.25ms)}\right]\right)$$

$$e^{-jmw_o(0.25ms)} = e^{-jm\frac{\pi}{2}}, \qquad e^{-jmw_o(-0.25ms)} = e^{jm\frac{\pi}{2}}$$

$$e^{-jm\frac{\pi}{2}} - e^{jm\frac{\pi}{2}} = -2j\sin\left(\frac{m\pi}{2}\right)$$

$$c_m = \frac{1}{T_O}\left(\frac{1}{-jmw_o t}\left[-2j\sin\left(\frac{m\pi}{2}\right)\right]\right)$$

$$c_m = \frac{2}{mw_o T_O}\sin\left(\frac{m\pi}{2}\right)$$

$$c_m = \frac{2}{m(\frac{2\pi}{T_O})T_O}\sin\left(\frac{m\pi}{2}\right)$$

$$c_m = \frac{\sin\left(\frac{m\pi}{2}\right)}{\pi m}$$

2) $c_o = \lim_{m\to 0}\frac{\sin\left(\frac{m\pi}{2}\right)}{\pi m}$

$$\frac{d}{d_m}\sin\left(\frac{m\pi}{2}\right) = \frac{\pi}{2}\cos(\frac{m\pi}{2})$$

$$c_o = \lim_{m\to 0}\frac{\frac{\pi}{2}\cos(\frac{m\pi}{2})}{\pi}$$

$$c_o = \frac{1}{2}\cos(0) = \frac{1}{2} * 1 = \frac{1}{2}$$

Section 3: