Given the following measurements:

<table>
<thead>
<tr>
<th>$T_p$ (ms)</th>
<th>$M_p$ (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.63</td>
<td>1.16</td>
</tr>
</tbody>
</table>

PLA-1: Use Equation (27),

$$M_p = 1 + e^{-\pi \zeta / \sqrt{1 - \zeta^2}}$$

to show that:

$$\zeta = \sqrt{\frac{\ln^2(M_p - 1)}{\pi^2 + \ln^2(M_p - 1)}}$$

and compute a numerical value of the damping factor $\zeta$. Is the circuit underdamped, critically-damped, or overdamped? (Explain and underline the correct answer.)

PLA-2: Compute a numerical value of the natural frequency $\omega_n$ (rad/s) using Equation (26),

$$T_p = \frac{\pi}{\omega_n \sqrt{1 - \zeta^2}}$$

and the previously-calculated value of $\zeta$.

PLA-3: Substitute the values of $\zeta$ and $\omega_n$ into the following quadratic polynomial and compute numerical values for its (complex) roots:

$$P(s) = s^2 + 2\zeta\omega_n s + \omega_n^2 = 0$$