SPRING MASS OSCILLATIONS

Experiment No. 1 (Procedure)

Procedure: -

1. Set the spring mass system into oscillation and acquire the data digitally. Store the data of time and displacement in a file (Excel in our case).
2. Plot the displacement versus time curve.
3. Find the time period T_D of the damped oscillations. Calculate $f_D = \frac{1}{T_D}$ and $w_D = 2\pi f_D$.
4. Calculate $\delta = \left(\frac{i}{j}\right) \ln\left(\frac{u_i}{u_{i+j}}\right)$ by assuming an appropriate value of j and hence determine ζ. Calculate $w_n = \frac{w_D}{\sqrt{1-\zeta^2}}$.
5. Identify u (0) from the data. Calculate v (0) by calculating slope from $\dot{u}(0) = \frac{u(t_1)-u(0)}{t_1-0}$.
6. Calculate u_0 and Φ_0.
7. Plot u(t) from the obtained parameters on the same graph as the raw data. Also plot the envelop $u_0 e^{-\zeta w_n t}$ and $-u_0 e^{-\zeta w_n t}$. Comment on the deviations between the raw data and the theoretical curve which arises due to experimental error.
8. Find the velocity and acceleration numerically and plot it versus time.
9. Note the poor quality of velocity and acceleration graphs which highlights the importance of data quality.

Observations: - Copy the time versus displacement data into an Excel sheet.

Results: - Write the results and conclusion in the Excel sheet.