Compute the response of a SDOF system shown below using “hybrid simulation”. Form four-person teams and divide the roles as follows:

- First member: Left spring
- Second member: Right spring
- Third member: Given resistance and force, compute target displacement
- Fourth member: Compute initial conditions, then, in each step assemble spring forces, request displacement target, disseminate displacement target to springs

System properties:
- Natural period 1 sec; damping ratio 5%:
  - Mass \( m = 0.0761 \) kips-sec\(^2\)/in
  - Stiffness \( k = 1.5 \) kips/in (for each spring)
  - Damping coefficient \( c = 0.0478 \) kips-sec/in
- Spring yield force \( r_y = 0.5 \) kip.

Excitation properties:
- Duration \( t_0 = 0.5 \) sec
- Intensity \( f_0 = 1.5 \) kips
Complete system state (force and displacement) for 10 time-steps with $\Delta t = 0.1$sec

Pre-compute:

\[
a_0 = \frac{1}{m}(f_0 - cv_0 - r_0)
\]

\[
d_{-1} = d_0 - \Delta t v_0 - \frac{\Delta t^2}{2} a_0
\]

\[
\frac{m}{\Delta t^2}
\]

\[
\frac{c}{2\Delta t}
\]

Iterate:

\[
d_{i+1} = \frac{1}{m} \left[ \frac{2m}{\Delta t^2} d_i - \left( \frac{m}{\Delta t^2} - \frac{c}{2\Delta t} \right) d_{i-1} - r_i + f_i \right]
\]

Results:

<table>
<thead>
<tr>
<th>Time (sec)</th>
<th>Excitation f (kips)</th>
<th>Total resistance r (kips)</th>
<th>Mass displacement d (in)</th>
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