A. Form static stiffness matrix $\mathbf{K}$, mass matrix $\mathbf{M}$ and damping matrix $\mathbf{C}$

B. Specify integration parameters β and γ

C. Calculate integration constants

$$b_1 = \frac{1}{\beta \Delta t^2} \qquad b_2 = \frac{1}{\beta \Delta t} \qquad b_3 = \beta - \frac{1}{2} \qquad b_4 = \gamma \, \Delta t \, b_1$$

$$b_5 = 1 + \gamma \, \Delta t \, b_2 \quad b_6 = \Delta t (1 + \gamma \, b_3 - \gamma)$$

D. Form effective stiffness matrix $\overline{\mathbf{K}} = \mathbf{K} + b_1 \mathbf{M} + b_4 \mathbf{C}$

E. Triangularize effective stiffness matrix $\overline{\mathbf{K}} = \mathbf{LDL}^T$

F. Specify initial conditions $\mathbf{u}_0, \ \dot{\mathbf{u}}_0, \ \ddot{\mathbf{u}}_0$

II. FOR EACH TIME STEP $t = \Delta t, \ 2\Delta t, \ 3\Delta t$ ------

A. Calculate effective load vector

$$\overline{\mathbf{F}}_t = \mathbf{F}_t + \mathbf{M}(b_1 \mathbf{u}_{t-\Delta t} - b_2 \dot{\mathbf{u}}_{t-\Delta t} - b_3 \ddot{\mathbf{u}}_{t-\Delta t}) + \mathbf{C}(b_4 \mathbf{u}_{t-\Delta t} - b_5 \dot{\mathbf{u}}_{t-\Delta t} - b_6 \ddot{\mathbf{u}}_{t-\Delta t})$$

B. Solve for node displacement vector at time **t**

$\mathbf{LDL}^T \mathbf{u}_t = \overline{\mathbf{F}}_t$ forward and back-substitution only

C. Calculate node velocities and accelerations at time **t**

$$\dot{\mathbf{u}}_t = b_4(\mathbf{u}_t - \mathbf{u}_{t-\Delta t}) + b_5 \dot{\mathbf{u}}_{t-\Delta t} + b_6 \ddot{\mathbf{u}}_{t-\Delta t}$$

$$\ddot{\mathbf{u}}_t = b_1(\mathbf{u}_t - \mathbf{u}_{t-\Delta t}) + b_2 \dot{\mathbf{u}}_{t-\Delta t} + b_3 \ddot{\mathbf{u}}_{t-\Delta t}$$

D. Go to Step II.A with $t = t + \Delta t$