MATLAB Pseudocode: M3 Project Synchronous Machine SS Model

- **Define Initial Parameters**
  - Define constants: frequency `f`, angular velocity `w`, voltage values (`Vf`, `VLine`, `Vph`), apparent power `S`, and power factor `pf`.

- **Compute Derived Quantities**
  - Calculate `theta` based on power factor.
  - Determine `Zl`, `rl`, and `Xl`.
  - Compute phase current `Ia`.
  - Calculate initial currents: `ifo`, `iao`, `ibo`, `ico`, `ikdo`, `ikqo`.

- **Set Simulation Parameters**
  - Define initial conditions `iniCon` for the ODE solver.
  - Specify the time span `tspan`.

- **Solve the State-Space Model**
  - Use `ode45` to solve the system of equations with the function `myode`.

```
iniCon = [iao;ibo;ico;ifo;ikdo;ikqo];
tspan = [0 30];
[t,x] = ode45(@myode, tspan, iniCon);  % Solving for State Space
Model (Synchronous Machine)
```

ODE Function (myode)

```
function dx = myode(t,x)
```

1. **Calculate angle theta based on time.**
2. **Define Parameters**
   - Set resistances: `rs`, `rf`, `rkd`, `rkq`.
   - Define inductances: `Lsv`, `Lmv`, `Lsa`, `Lff`, etc.
   - Repeat initialization of other constants.
3. **Compute Inductance Matrix (`L`)**
   - Compute self and mutual inductances (`Laa`, `Lbb`, `Lab`, etc.) as functions of angle `theta`.

```
Laa =  Lsa+Lsv*cos(2*theta);
```

   - Calculate derivatives of inductances (`dLaa`, `dLab`, etc.).

```
dLaa = -2*Lsv*sin(2*theta);
```

4. **Define Resistance Matrix (`R`)**
    - Set up the resistance matrix with resistances `rs`, `rl`, `rf`, `rkd`, `rkq`.
5. **Define System Matrices**
    - Compute inductance matrix `L`.
    - Compute the derivative of the inductance matrix `dL`.
    - Calculate system matrices `A` and `B`.
6. **Define Input Vector (`u`)**
    - Set input voltages.
7. **Compute State Derivative**
8. Calculate `dx` using the state-space equation: $dx=A \cdot x+B \cdot u$ **Return State Derivative (`dx`)**