```
(* Rotor Angle θ is a function of time *)
θ = θ[t];

(* Assuming sinusoidally varying phase inductances
  Ld is the inductance of a phase when the d-axis of the rotor is alighed with it
  Lq is the inductance of a phase when the q-
 axis of the rotor is aligned with it *)
Ld = Lq;
La = (1/2) * (Ld + Lq) + (1/2) * (Ld - Lq) * Cos[-2 * θ];
Lb = (1/2) * (Ld + Lq) + (1/2) * (Ld - Lq) * Cos[2 * (2 * π/3 - θ)];
Lc = (1/2) * (Ld + Lq) + (1/2) * (Ld - Lq) * cos[-2 * (-2 * π/3 - θ)];

(* Sinusoidally varying flux linkage *)

λa = λ * Cos[-θ] + λ2 * Cos[-5 * θ];
λb = λ * Cos[2 * π/3 - θ] + λ2 * Cos[5 * (2 * π/3 - θ)];
λc = λ * Cos[-2 * π/3 - θ] + λ2 * Cos[5 * (-2 * π/3 - θ)];

λr = {{λa}, {λb}, {λc}};
dλr = D[λr, t];

(* Construct inductance matrix assuming no mutual inductances*)
L = {{La, 0, 0},
   {0, Lb, 0},
   {0, 0, Lc}};

(* Construct resistance matrix *)
R = {{r, 0, 0},
   {0, r , 0},
   {0, 0, r}};

(* Phase currents *)
i = {{ia[t]}, {ib[t]}, {ic[t]}};

idq = {{id[t]}, {iq[t]}, {i0[t]}};

(* Dq0 Transform *)
T = (2/3) * {{Cos[θ], Cos[θ - 2 * π/3], Cos[θ + 2 * π/3]},
    {-Sin[θ], -Sin[θ - 2 * π/3], -Sin[θ + 2 * π/3]},
    {1/2, 1/2, 1/2}};
```

```
invT = Simplify[Inverse[T]];

λdq = Simplify[T.λr];
dλdq = Chop[Simplify[T.D[λr, t]]];

(*T*(L.D[i, t] + D[L, t].i + D[λr, t] + R.i)*)

t ∈ Reals;
L ∈ Reals;
θ ∈ Reals;
R ∈ Reals;
λr ∈ Reals;
i ∈ Reals;
idq ∈ Reals;

(*vdq = T.(L.D[i, t] + D[L, t].i + D[λr, t] + R.i);*)
vdq = T.(L.D[invT.idq, t] + D[L, t].(invT.idq) + R.(invT.idq)) + dλdq;

(*Simplify[vdq, (ia+ib+ic)==0];*)

vd =  Chop[Simplify[vdq[[1, All]]]]
vq = Chop[Simplify[vdq[[2, All]]]]

idq = T.i;
didq = D[idq, t];
```

Out[57]= {r id[t] + Lq id′[t] − (Lq iq[t] + 5 λ2 Sin[6 Θ[t]]) Θ′[t]}

Out[58]= {r iq[t] + Lq iq′[t] + (λ − 5 λ2 Cos[6 Θ[t]] + Lq id[t]) Θ′[t]}