Q1) Analytical Modelling

Part a)

Reluctance of the system is derived according to angle of the rotor.

For θ = 0 rad;

For θ > 0 and θ <2\*arcsin(7.5/12);

For θ >2\*arcsin(7.5/12) and θ <(π-2\*arcsin(7.5/12))

For θ >(π-2\*arcsin(7.5/12))

Inductances can be calculating according to reluctances by using following formula;

Based on these formulas, reluctance and inductance of the system is calculated by using MATLAB and results can be seen in Figure 1 and 2 respectively.

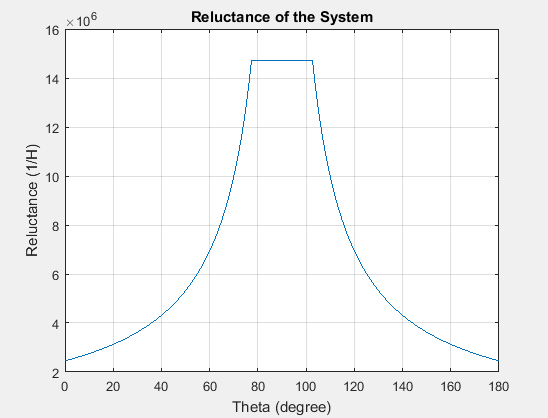


Figure 1

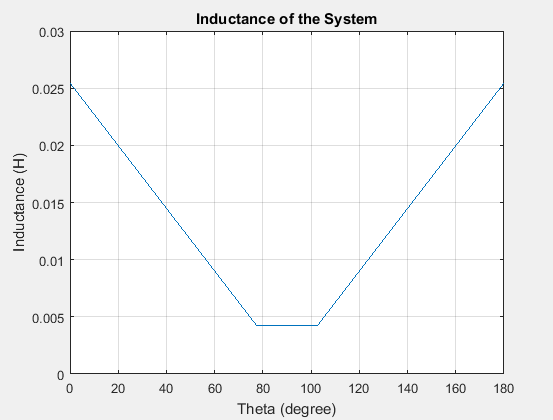


Figure 2

Torque of the system can be calculated using following formula, analytically it can be seen in Figure 3.

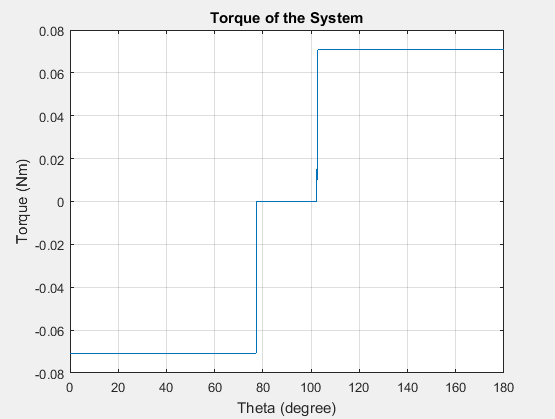


Figure 3