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Q 9] Design BLDC motor using basic simulink block. Demonstrate speed control system with this motor.

Ans: To design BLDC motor their are many approches. but we use one of them.

* Genetic Algorithm: It is metaheristic algo. where we reach to any optimal result after many generation. by performing genetic algorithm we can find optimal value of Ki, Kp, Kd. to attenulte the oscilation of frequency responce. also control speed.

* Mathamatical Model of BLDC Motor

A] Electrical Part:

$$Ud(s) = (ra + La s)\, I(s) + Ke\, \Omega(s)$$

Vd = DC bus Vtg.
ra = winding resistance.
La = winding equivalent line inductance
Ke = back emf coefficient.
Ω = mechanical angular speed of motor
I = winding phase current in steady state.

$$Te(s) = K_T I(s)$$

Te = Electromagnetic Torque
K_T = motor torque coefficient.

B] Mechanical Part:

$$T_e(s) - T_l(s) = (Js + B_v)\Omega(s)$$

T_l = load Torque
J = moment of inertia of rotor
B_v = Coefficient of Viscus friction

* Electrical Part Transfer Function

$$\frac{I(s)}{U_d(s) - k_e\Omega(s)} = \frac{1}{(r_a + L_a s)}$$

* Mechanical Part Transfer Function

$$\frac{\Omega(s)}{T_e(s) - T_l(s)} = \frac{1}{(Js + B_v)}$$