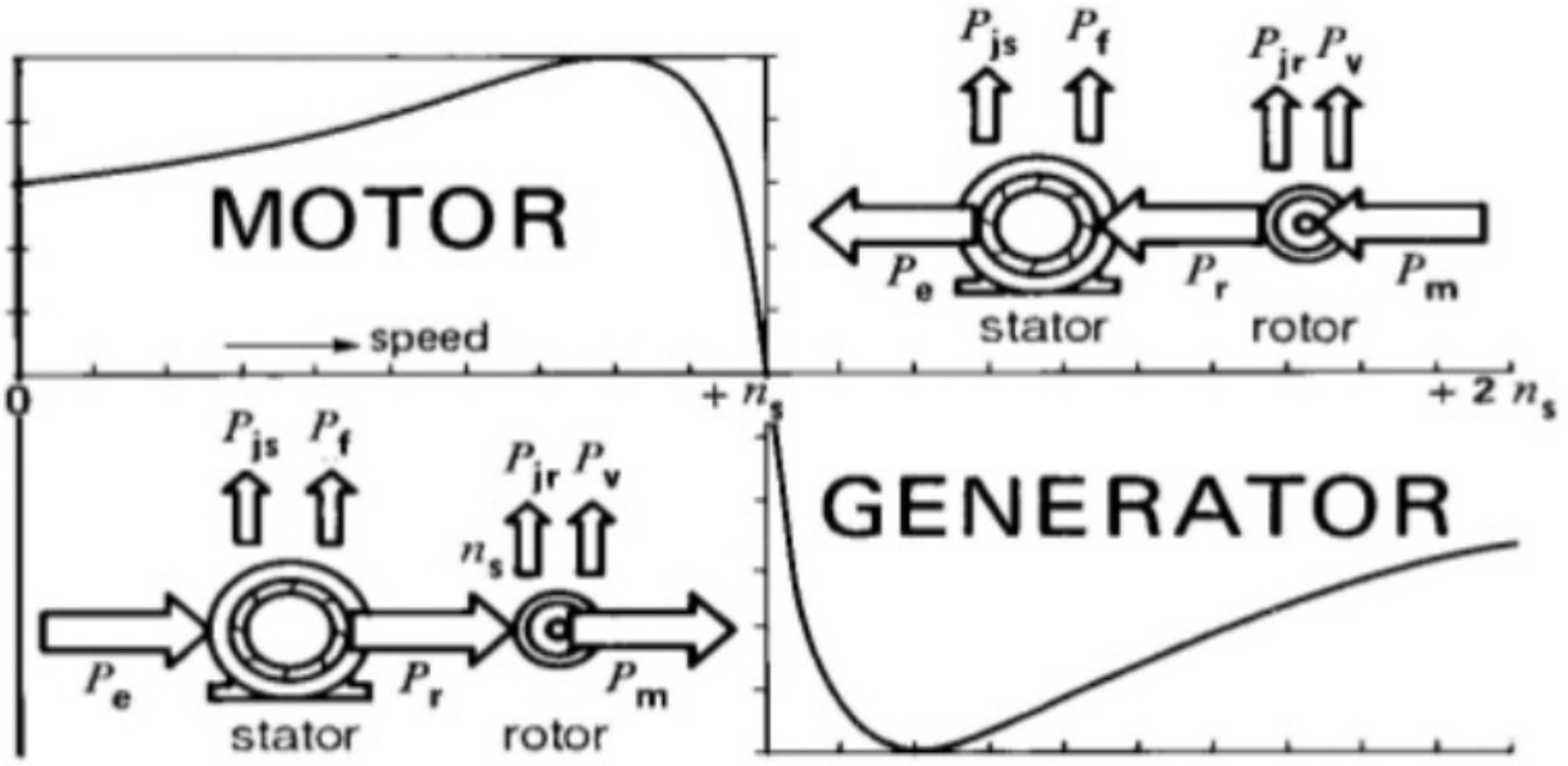
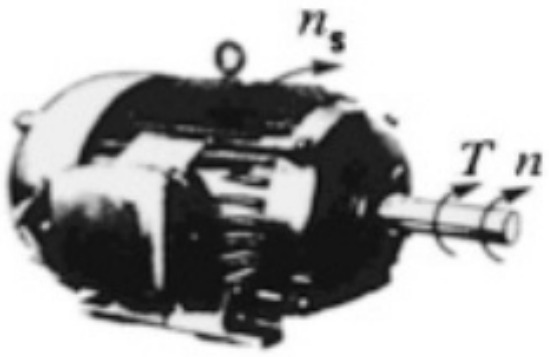
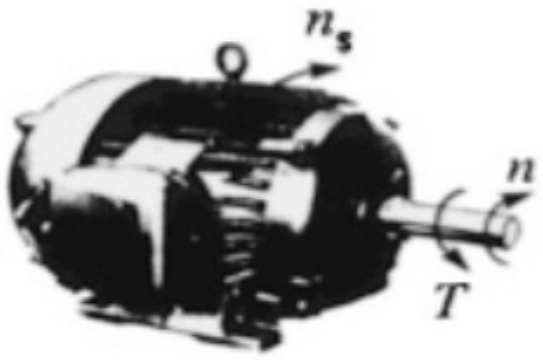
Comments

1. The induced torque is zero at synchronous speed. Discussed earlier.
2. The curve is nearly linear between no-load and full load. In this range, the rotor resistance is much greater than the reactance, so the rotor current, torque increase linearly with the slip.
3. There is a maximum possible torque that can't be exceeded. This torque is called *pullout torque* and is 2 to 3 times the rated full-load torque.

Complete Speed-torque c/c







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Maximum torque

- Maximum torque occurs when the power transferred to R_2/s is maximum.
- This condition occurs when R_2/s equals the magnitude of the impedance $R_{TH} + j\,(X_{TH} + X_2)$

$$\frac{R_2}{s_{T_{max}}} = \sqrt{R_{TH}^2 + (X_{TH} + X_2)^2}$$

$$s_{T_{max}} = \frac{R_2}{\sqrt{R_{TH}^2 + (X_{TH} + X_2)^2}}$$

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Maximum torque

- The corresponding maximum torque of an induction motor equals

$$\tau_{max} = \frac{1}{2\omega_s}\left(\frac{3V_{TH}^2}{R_{TH} + \sqrt{R_{TH}^2 + (X_{TH} + X_2)^2}}\right)$$

The slip at maximum torque is directly proportional to the rotor resistance R_2

The maximum torque is independent of R_2

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Maximum torque

- Rotor resistance can be increased by inserting external resistance in the rotor of a wound-rotor induction motor.

The

value of the maximum torque remains unaffected

but

the speed at which it occurs can be controlled.

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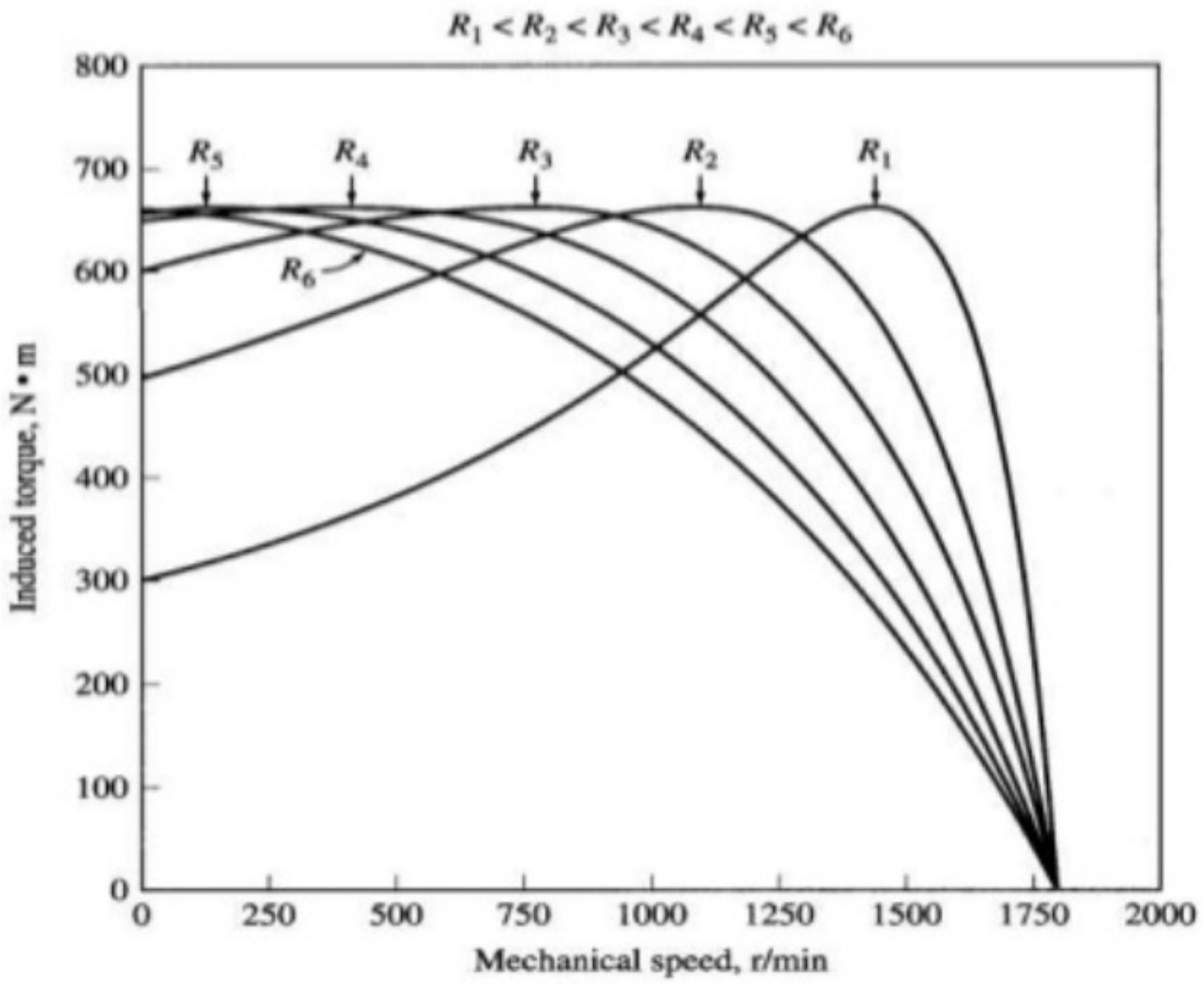
Maximum torque



Effect of rotor resistance on torque-speed characteristic 25