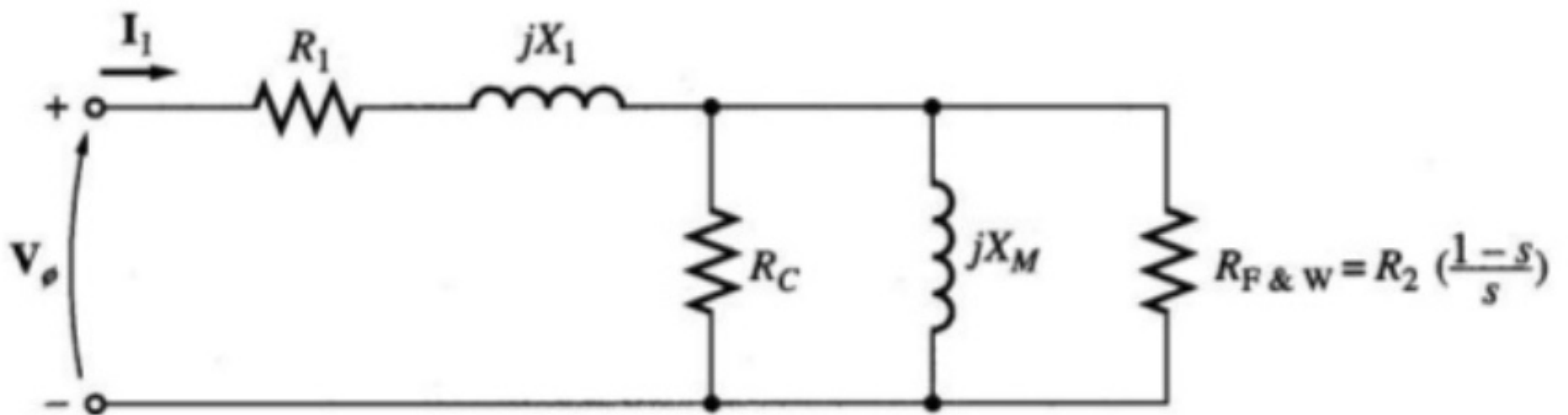
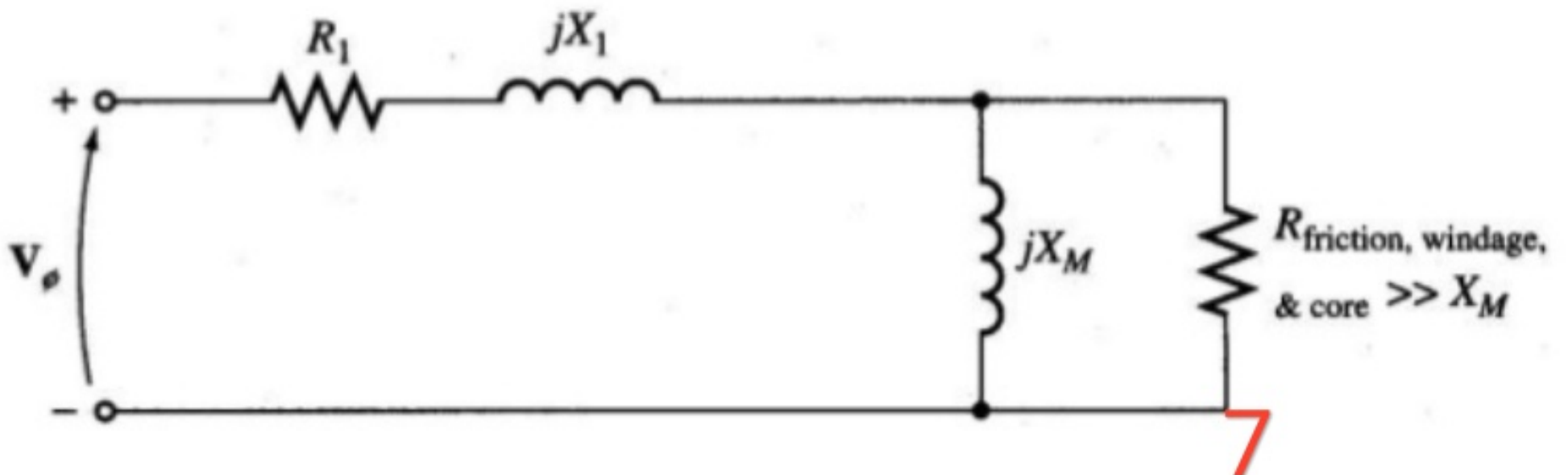


No-load test



5. Combining R_C & R_{F+W} we get.....



No-load test

6. At the no-load conditions, the input power measured by meters must equal the losses in the motor.
7. The P_{RCL} is negligible because I_2 is extremely small because $R_2(1-s)/s$ is very large.
8. The input power equals

$$\begin{aligned} P_{in} &= P_{SCL} + P_{core} + P_{F\&W} \\ &= 3I_1^2 R_1 + P_{rot} \end{aligned}$$

Where

$$P_{rot} = P_{core} + P_{F\&W}$$

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No-load test

9. The equivalent input impedance is thus approximately

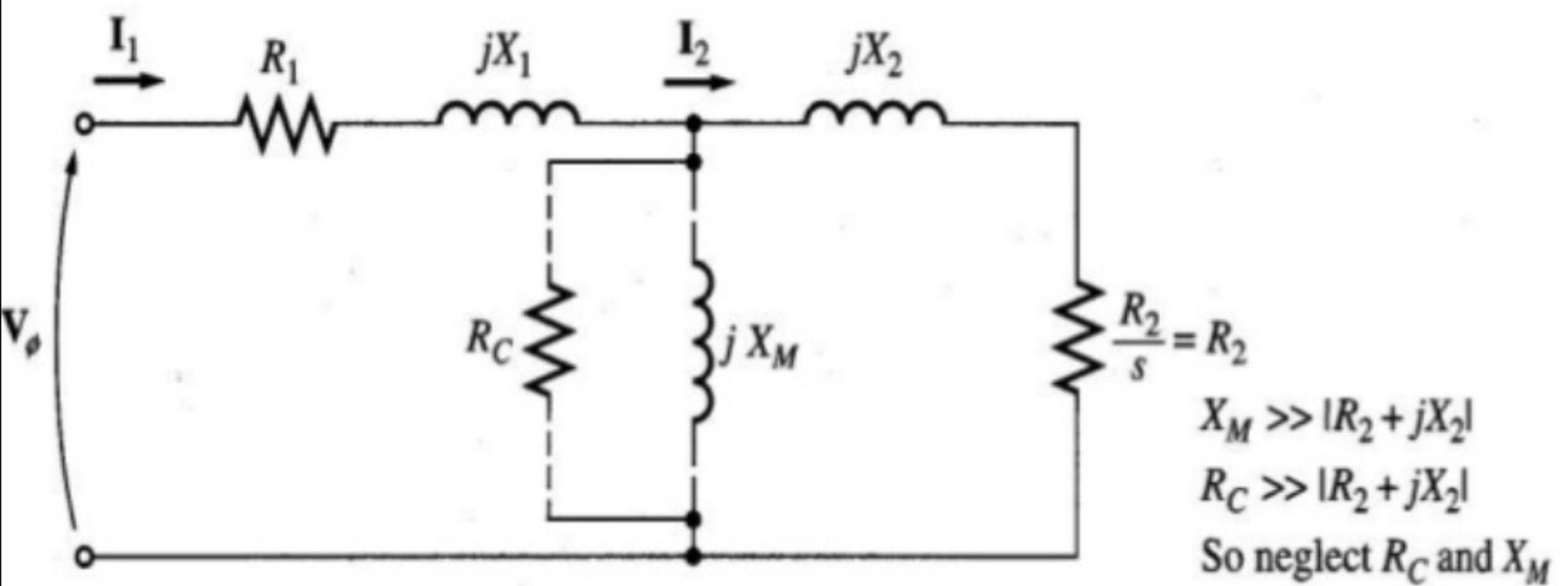
$$|Z_{eq}| = \frac{V_\phi}{I_{1,pl}} \approx X_1 + X_M$$

If X_1 can be found, in some other fashion, the magnetizing impedance X_M will be known

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Blocked-rotor test

- In this test, the rotor is **locked** or **blocked** so that **it cannot move**, a voltage is applied to the motor, and the resulting voltage, current and power are measured.



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Blocked-rotor test

- The AC voltage applied to the stator is adjusted so that the current flow is approximately full-load value.
- The locked-rotor power factor can be found as

$$PF = \cos \theta = \frac{P_{in}}{\sqrt{3}V_L I_L}$$

- The magnitude of the total impedance

$$|Z_{LR}| = \frac{V_{\phi}}{I}$$

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Blocked-rotor test

$$\begin{aligned} |Z_{LR}| &= R_{LR} + jX'_{LR} \\ &= |Z_{LR}| \cos \theta + j|Z_{LR}| \sin \theta \end{aligned}$$

$$R_{LR} = R_1 + R_2$$

$$X'_{LR} = X'_1 + X'_2$$

Where X'_1 and X'_2 are the stator and rotor reactances at the test frequency respectively

$$R_2 = R_{LR} - R_1$$

$$X_{LR} = \frac{f_{rated}}{f_{test}} X'_{LR} = X_1 + X_2$$

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Blocked-rotor test

| | X_1 and X_2 as function of X_{LR} | |
|--------------|-----------------------------------------|--------------|
| Rotor Design | X_1 | X_2 |
| Wound rotor | $0.5 X_{LR}$ | $0.5 X_{LR}$ |
| Design A | $0.5 X_{LR}$ | $0.5 X_{LR}$ |
| Design B | $0.4 X_{LR}$ | $0.6 X_{LR}$ |
| Design C | $0.3 X_{LR}$ | $0.7 X_{LR}$ |
| Design D | $0.5 X_{LR}$ | $0.5 X_{LR}$ |

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