Questions from the same exercise can be combined together to increase difficulty.
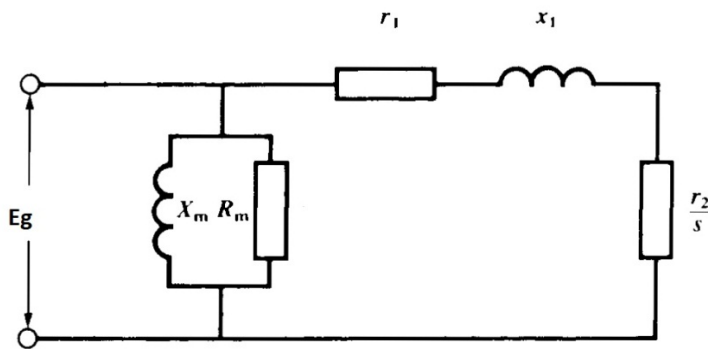

Example 15-1 (r_1)

A no-load test conducted on a 30hp, 835rpm, 440V, 3-phase, 60Hz squirrel-cage induction motor shown below yielded the following results:

No-load voltage (line-to-line):   440V

No-load current: 14A

No-load power: 1470W

Resistance measured between two terminals: 0.5Ω

The locked-rotor test conducted at reduced voltage gave the following results:

Locked-rotor voltage (line-to-line):   153V

Locked-rotor power: 7200W

Locked-rotor current: 60A

What is the value of r_1?

a) 0.5Ω.

b) 0.25Ω.

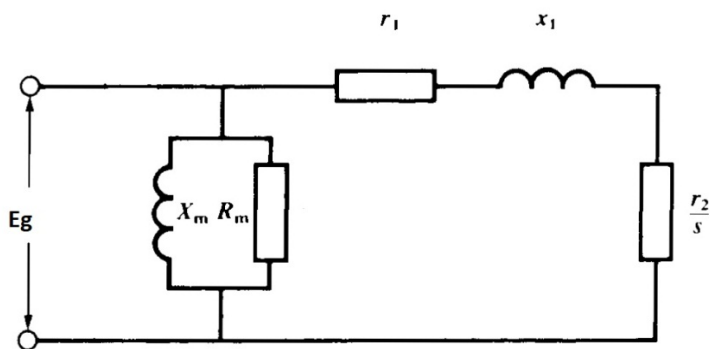c) 31.4Ω.

d) 2.55Ω.

Example 15-1 (X_m)

A no-load test conducted on a 30hp, 835rpm, 440V, 3-phase, 60Hz squirrel-cage induction motor shown below yielded the following results:

No-load voltage (line-to-line):   440V

No-load current: 14A

No-load power: 1470W

Resistance measured between two terminals: 0.5Ω

The locked-rotor test conducted at reduced voltage gave the following results:

Locked-rotor voltage (line-to-line): 153V

Locked-rotor power: 7200W

Locked-rotor current: 60A

What is the value of X_m?

a) 31.5Ω.

b) 33Ω.

c) 18.3Ω.

d) 19.9Ω.

Example 15-1 (R_m)

A no-load test conducted on a 30hp, 835rpm, 440V, 3-phase, 60Hz squirrel-cage induction motor shown below yielded the following results:
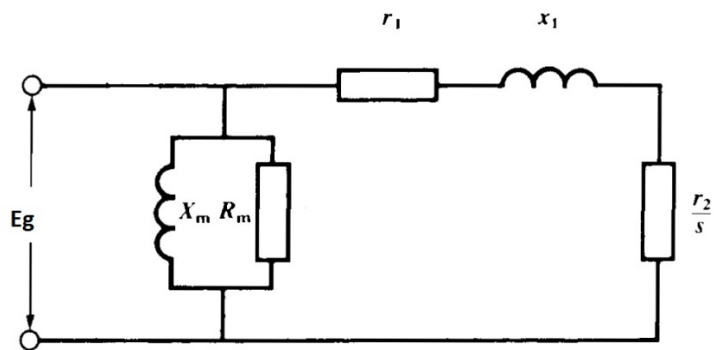
No-load voltage (line-to-line): 440V

No-load current: 14A

No-load power: 1470W

Resistance measured between two terminals: 0.5Ω

The locked-rotor test conducted at reduced voltage gave the following results:

Locked-rotor voltage (line-to-line): 153V

Locked-rotor power:	7200W
Locked-rotor current:	60A

What is the value of R_m?

a) 146.3Ω.

b) 439Ω.

c) 131.7Ω.

d) 395.1Ω.

Example 15-1 (x_1)

A no-load test conducted on a 30hp, 835rpm, 440V, 3-phase, 60Hz squirrel-cage induction motor shown below yielded the following results:

No-load voltage (line-to-line):	440V
No-load current:	14A
No-load power:	1470W
Resistance measured between two terminals:	0.5Ω

The locked-rotor test conducted at reduced voltage gave the following results:

Locked-rotor voltage (line-to-line):	153V
Locked-rotor power:	7200W
Locked-rotor current:	60A
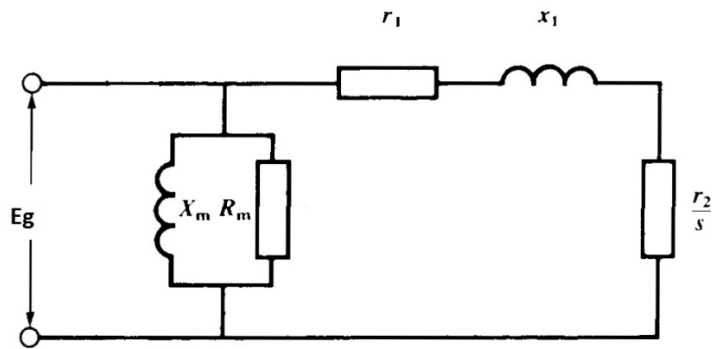
What is the value of x_1?

a) 2.6Ω.

b) 1.8Ω.

c) 3Ω.

d) 1.42Ω.

15-2 (Z_1)

A wye-connected squirrel-cage motor having a synchronous speed of 900rpm has a stator resistance of 0.7Ω and an equivalent rotor resistance of 0.5Ω. The total leakage reactance is 5Ω and the line-to-neutral voltage is 346V. What is the value of $Z_1 < \alpha$ (r_1+jx_1)?

a) 5.05Ω < 82°. x

b) 5.02Ω < 84.2°.

c) 5Ω < 90°.

d) 5Ω < 0°.

15-2 (n_b)

A wye-connected squirrel-cage motor having a synchronous speed of 900rpm has a stator resistance of 0.7Ω and an equivalent rotor resistance of 0.5Ω. The total leakage reactance is 5Ω and the line-to-neutral voltage is 346V. What is the speed when the breakdown torque is reached?

a) 775rpm.

b) 811rpm.

c) 900rpm.

d) 89rpm.

15-2 (I_1)

A wye-connected squirrel-cage motor having a synchronous speed of 900rpm has a stator resistance of 0.7Ω and an equivalent rotor resistance of 0.5Ω. The total leakage reactance is 5Ω and the line-to-neutral voltage is 346V. What is the current I_1 at the breakdown torque?

a) 78.6A.

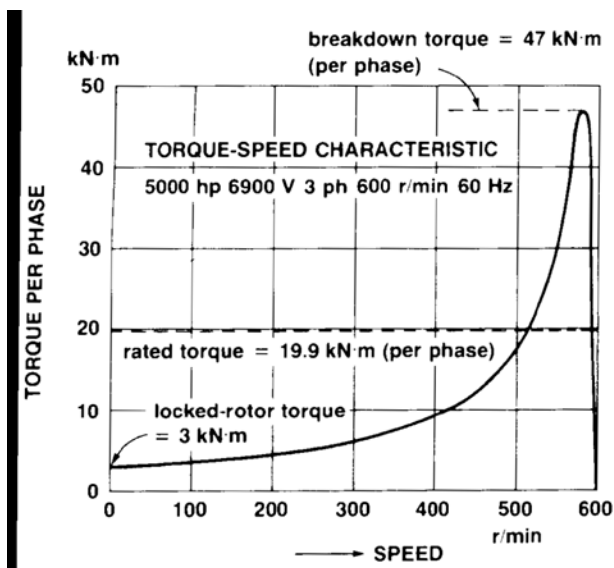b) 90.8A

c) 45.4A.

d) 45.7A.

15-2 (T_b)

A wye-connected squirrel-cage motor having a synchronous speed of 900rpm has a stator resistance of 0.7Ω and an equivalent rotor resistance of 0.5Ω. The total leakage reactance is 5Ω and the line-to-neutral voltage is 346V. What is the breakdown torque?

a) 331.1Nm.

b) 441.8Nm.

c) 111.3Nm.

d) 110.5Nm.

15-6 (breakdown torque)

If the line voltage for the motor of the following figure is dropped to 6200V, what is the new breakdown torque?

breakdown torque = 47 kN·m (per phase)

TORQUE-SPEED CHARACTERISTIC
5000 hp 6900 V 3 ph 600 r/min 60 Hz

rated torque = 19.9 kN·m (per phase)

locked-rotor torque = 3 kN·m

TORQUE PER PHASE — kN·m

SPEED — r/min

a) 42232Nm.

b) 37948Nm.

c) 52307Nm.

d) 58212Nm.

15-6 (starting torque)

If the line voltage for the motor of the following figure is dropped to 6200V, what is the new starting torque?
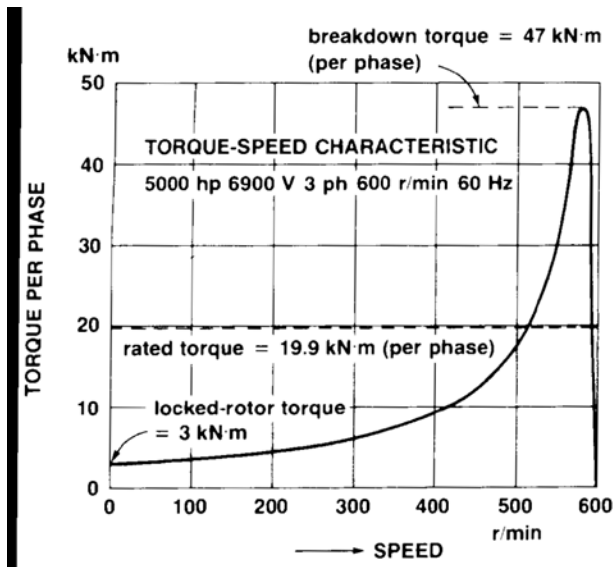
a) 2696Nm.

b) 3339Nm.

c) 2422Nm.

d) 3716Nm.