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Energy Efficient (EE)Motor parameters
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EE Motor

f=50.000000
p=4.000000
V1=219.393102
R1=1.500000
X1=3.642000
Xm=72.252000
X2p=3.642000
R2p=1.994000

SE Motor

f=50.000000
p=4.000000
V1=219.393102
R1=2.087000
X1=4.274000
Xm=66.560000
X2p=4.274200
R2p=2.122000
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Question 1:Thevenin Equiv Cct Parameters for EE and SE Motor:
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EE Motor

Vth=208.824087
Rth=1.358959
Xth=3.494087

SE Motor

Vth=206.065883
Rth=1.841148
Xth=4.070361
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QUESTION 2:Torque versus speed characteristics for EE and SE Motor:
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2.a)
 Starting torque for EE Motor: 26.7137 Nm
 Starting torque for SE Motor: 20.1658 Nm

 The starting torque will vary with a change in the rotor resistance R2p.
 The starting torque is also proportional to the square of supply voltage Vth.

2.b)
 Maximum torque for EE Motor: 48.2903 Nm
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Maximum torque for SE Motor: 39.0407 Nm

The maximum torque will vary with a change in the supply voltage Vth, as it is independent of R2p.

2.c) Speed at which maximum torque occurs for EE Motor: 1088.2622 rpm
Speed at which maximum torque occurs for SE Motor: 1127.5129 rpm

The value of the rotor circuit resistance R2p determines the speed at which maximum torque will occur.

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QUESTION 3: Stator Current vs. Speed Characteristics for EE and SE Motor:
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3.a) Stator current at start-up
Stator current for EE Motor at start-up: 27.8299 < -65.21° A
Stator current for SE Motor at start-up: 23.7497 < -64.62° A

At start-up, the stator current is high because the slip is 1, leading to higher rotor resistance and higher current draw.
b) The stator current at start-up will be highest due to the high slip (s=1). Under no-load conditions, the slip is small (close to 0), and the current decreases significantly, as most of the current is used to magnetize the machine. Under full-load conditions, the slip increases, and the stator current increases again due to higher losses in the rotor resistance.

3.c) Stator current at maximum torque
Stator current for SE Motor at maximum torque: 19.6865 < -43.94° A
Stator current for SE Motor at maximum torque: 16.5792 < -43.97° A
At maximum torque, the stator current is higher as the motor draws more current to maintain the required torque. The value depends on the supply voltage and the stator impedance.

3.d) Stator current under no-load conditions
Stator current for SE Motor under no-load:: 2.8902 < -88.87° A
Stator current for SE Motor under no-load:: 3.0959 < -88.31° A
Under no-load conditions, the stator current is relatively low as only the magnetizing current is required to maintain the magnetic field.

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QUESTION 4: Power Factor vs. speed characteristics for EE and SE Motor:
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4.a) Power factor at start-up
Power factor at start-up for EE motor: 0.4194
Power factor at start-up for SE motor: 0.4286

4.b) Power factor at max torque
Power factor at max torque for EE motor: 0.7200
Power factor at max torque for SE motor: 0.7197

4.c) Power factor at no-load

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Power factor at no-load for EE motor: 0.0198
Power factor at no-load for SE motor: 0.0295
Expect very low power factor (0.1-0.3) due to dominant magnetizing current. Edit this !
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QUESTION 5: Power vs. speed characteristics for EE and SE Motor:
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5.a) Stator and Rotor Copper losses at start-up
Stator copper loss at start-up for EE motor: 3485.2593 W
Rotor copper loss at start-up for EE motor: 1398.7268 W

Stator copper loss at start-up for SE motor: 3531.5161 W
Rotor copper loss at start-up for SE motor: 1055.8785 W

5.b) Stator and Rotor Copper losses at no-load
Stator copper loss at no-load for EE motor: 37.5901 W
Rotor copper loss at no-load for EE motor: 0.0000 W

Stator copper loss at no-load for SE motor: 60.0108 W
Rotor copper loss at no-load for SE motor: 0.0000 W
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QUESTION 6: Efficiency vs. speed characteristics for EE and SE Motor:
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Efficiency at maximum torque for SE motor: 58.6958 W
Efficiency at maximum torque for EE motor: 58.9884 W

Maximum Efficiency for SE motor: 91.4108 %
Maximum Efficiency for EE motor: 93.9493 %

Speed n at maximum efficiency for SE motor: 1467.7500 RPM
Speed n at maximum efficiency for EE motor: 1475.2500 RPM

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QUESTION 7: Adding a Centrifugal pump as a load to the EE and SE Motor:
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Unrecognized function or variable 'k_Load'.

Error in PartA (line 386)
T_Load = k_Load .* (w.^2);
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