

1.

SOLUTION The speed of a synchronous machine is related to its frequency by the equation

$$f_{se} = \frac{n_{sm} P}{120} \quad (3-34)$$

To make a 50 Hz and a 60 Hz machine have the same mechanical speed so that they can be coupled together, we see that

$$n_{\text{sync}} = \frac{120(50 \text{ Hz})}{P_1} = \frac{120(60 \text{ Hz})}{P_2}$$
$$\frac{P_2}{P_1} = \frac{6}{5} = \frac{12}{10}$$

Therefore, a 10-pole synchronous motor must be coupled to a 12-pole synchronous generator to accomplish this frequency conversion.

2.

solution:

a) $n = f \cdot 60 / (p/2) = 1200 \text{ rpm}$

b) $\phi = \frac{2}{\pi} B \frac{2\pi r L}{6} = 0.937 \text{ Wb}$ (请关注最大值, 平均值, 有效值还有基波、谐波等概念)

c). $E_{rms} = 4.44 f N \phi = 4.44 \times 60 \times (3 \times 11) \times 0.937 = 8237 \text{ V}$