13.9 UYGULAMALAR

Trafoların Kullanım Alanları:

- İzolasyon Araç Olarak Kullanım:

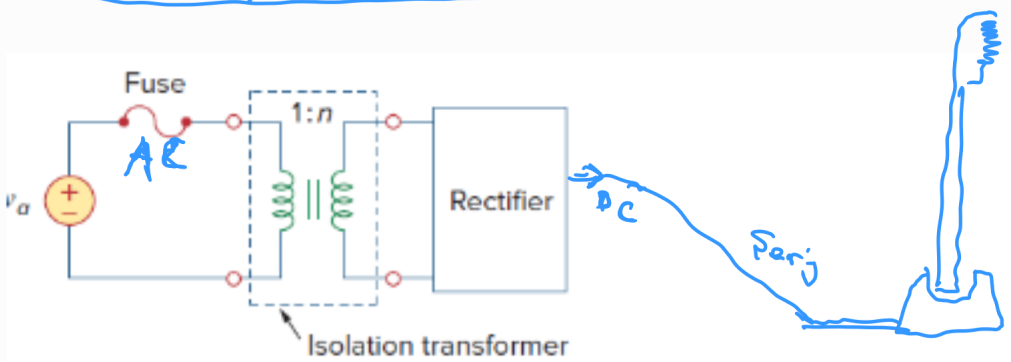
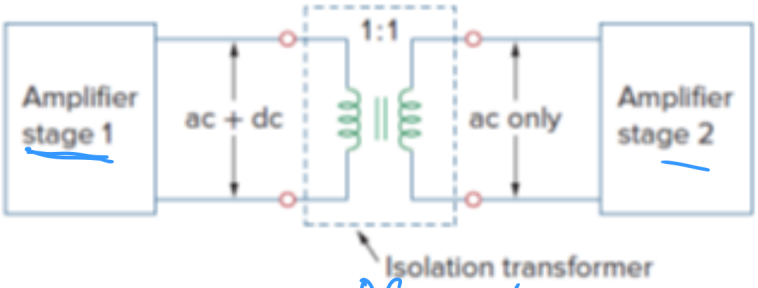


Figure 13.59
A transformer used to isolate an ac supply from a rectifier.



DC geçirmez.

Figure 13.60
A transformer providing dc isolation between two amplifier stages.

- Yüksek gerilim hatlarındaki gerilimi güvenli bir şekilde ölçmek için trafo kullanılır.
  Gerilim düşürülür, ölçülür, sarım oranı kullanılarak gerçek gerilim bulunur

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Determine the voltage across the load in Fig. 13.62. **Example 13.15**

Solution:
We can apply the superposition principle to find the load voltage. Let $v_L = v_{L1} + v_{L2}$, where v_{L1} is due to the dc source and v_{L2} is due to the ac source. We consider the dc and ac sources separately, as shown in Fig. 13.63. The load voltage due to the dc source is zero, because a time-varying voltage is necessary in the primary circuit to induce a voltage in the secondary circuit. Thus, $v_{L1} = 0$. For the ac source and a value of R_s so small it can be neglected.

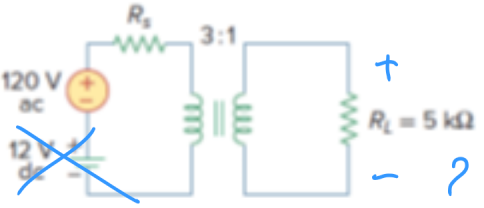
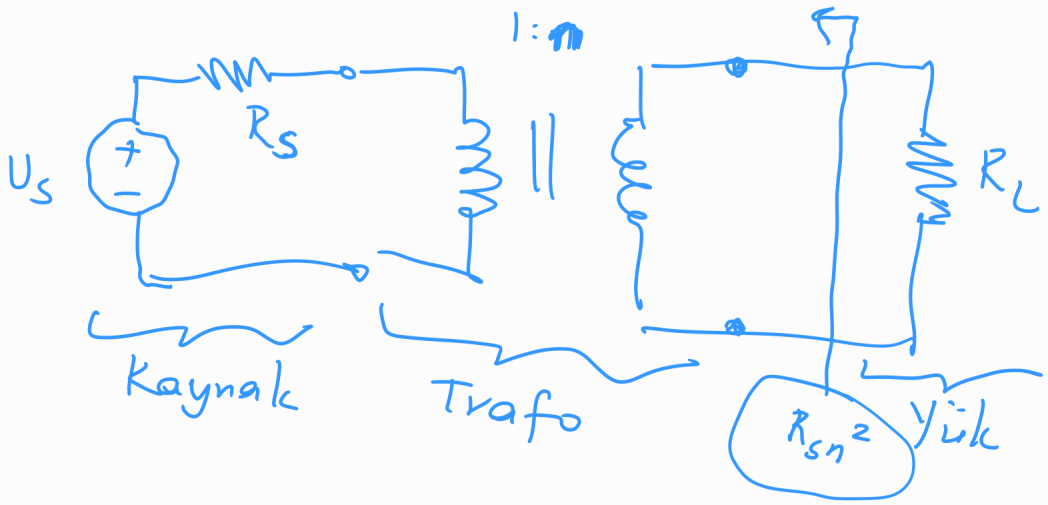


Figure 13.62
For Example 13.15.

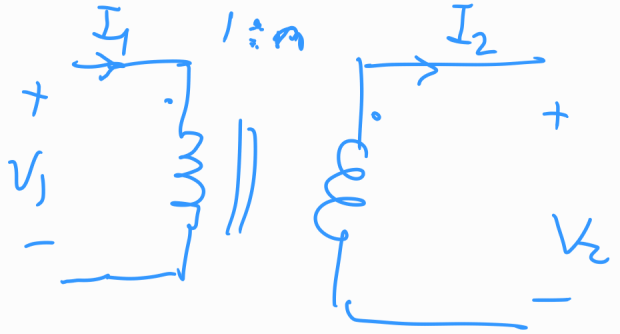
(1) Trafo DC geçirmez. Bundan dolayı (12V dc) yükte gerilim oluşmaz.

(2) 120 V (ac) : $R_s = 0$ almış. ihmal etmiş. Yükte 40 V (ac) oluşur.

- Empedans uyumlama oranı olarak kullanımı.



Maks. güç transfer etmek için.



$$\Rightarrow \frac{V_2}{V_1} = n$$

$$\frac{I_2}{I_1} = \frac{1}{n}$$

$$Z_1 = \frac{V_1}{I_1} = \frac{V_2/n}{I_2\, n} = \frac{V_2}{I_2}\,\frac{1}{n^2}$$

$$= Z_2 \frac{1}{n^2}$$

$$\boxed{Z_2 = Z_1\, n^2}$$

Example 13.16

The ideal transformer in Fig. 13.65 is used to match the amplifier circuit to the loudspeak er to achie ve maximum po wer transfer. The Thevenin (or output) impedance of the amplifier is 192 Ω, and the internal impedance of the speaker is 12 Ω. Determine the required turns ratio.

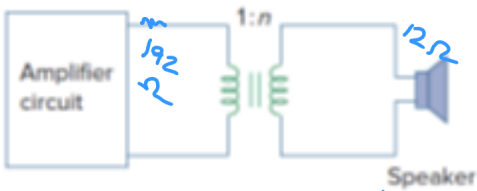


Figure 13.65
Using an ideal transformer to match the speaker to the amplifier; for Example 13.16.

hoparlör

Solution:
We replace the amplifier circuit with the Thevenin equivalent and reflect the impedance $\mathbf{Z}_L = 12\ \Omega$ of the speaker to the primary side of the ideal transformer. Figure 13.66 shows the result. For maximum power transfer,

n' 1'den küçük olmalı.

$$n = \sqrt{\frac{12}{192}} = \sqrt{\frac{1}{16}} = \frac{1}{4}$$ olmalı

- Güç dağıtımında kullanılır:

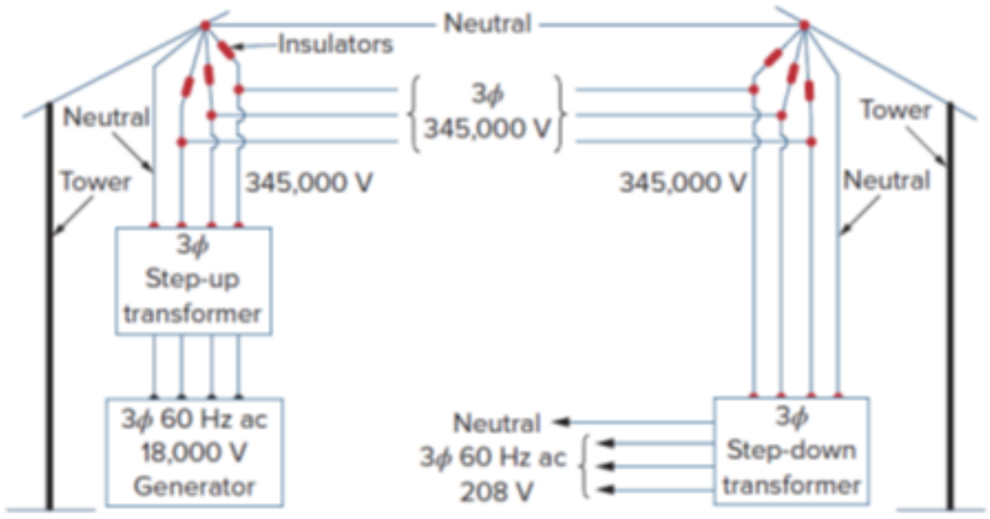


Figure 13.67
A typical power distribution system.

Güç dağıtımı:

1) Üretim:
   - Santralde: Yüzlerce Mega Volt-Amper Güç.
     ör. 18kV gerilim
     o zaman ~10^4 A akım.

2) İletim:
   - Step-up trafo: 154 kV veya 384kV
   - 100kVA = 1000 V x 100 A
     veya
     = 10000 V x 10 A ✓ (daha ince kablo, daha az I^2R kaybı)
   - Yüzlerce km iletiliyor.
     (40 mm çapında kablo, 1000 Amper)

3) Dağıtım:
   - 33kV veya 15.8 kV'a indirilir.
     buradanda 33kV → 15.8 kV, 10kV, 6.3kV, 0.4kV

– Evlere işyerlerine dağıtılır (220V, 380V)

Example 13.17

A distribution transformer is used to supply a household as in Fig. 13.68. The load consists of eight 100-W bulbs, a 350-WTV, and a 15-kW kitchen range. If the secondary side of the transformer has 72 turns, calculate: (a) the number of turns of the primary winding, and (b) the current I_p in the primary winding.

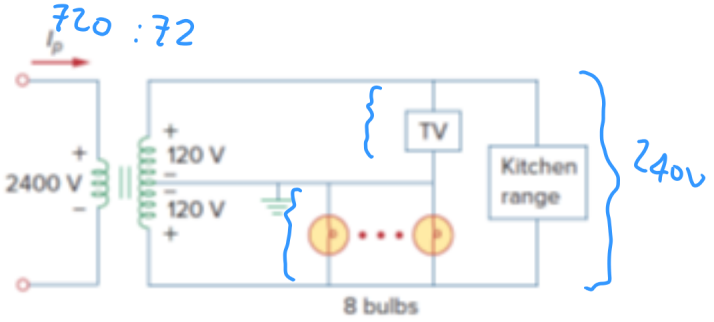


Figure 13.68
For Example 13.17.

8 x 100 W Ampul
350 W TV
+ 15000 W Mutfak
16150 W

gücün korunumu

birinci taraftaki güçler 16150 W

$$I_p = \frac{16150}{2400} = 6.729\ A$$