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

21-1

Which one of the following properties of the diode is NOT true:

a) When no voltage is applied across the diode, it acts like an open switch.
b) If we apply a reverse bias voltage with whatever amplitude the diode will always operate normal and act like an open switch.
c) A typical voltage drop of a diode is 0.7V.
d) If a momentary forward voltage of 0.7V or more is applied across the terminals of a diode, the terminals of the diode become short circuited.

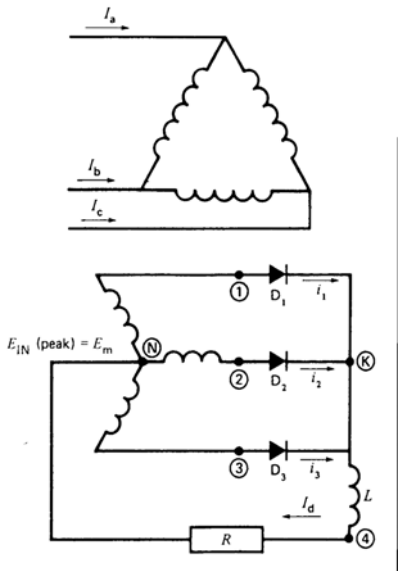
21-2

Which one of the following statements about a thyristor is NOT true:

a) Only a pulse of short duration in the gate of the thyristor is needed to turn it on.
b) A thyristor can only be switched on but not off using its gate.
c) A thyristor can be switched off when current is flowing through it.
d) One cannot switch on a thyristor if it is not forward biased.

21-3

The three phase transformer shown in the figure below produces a secondary line voltage of 2.4kV.

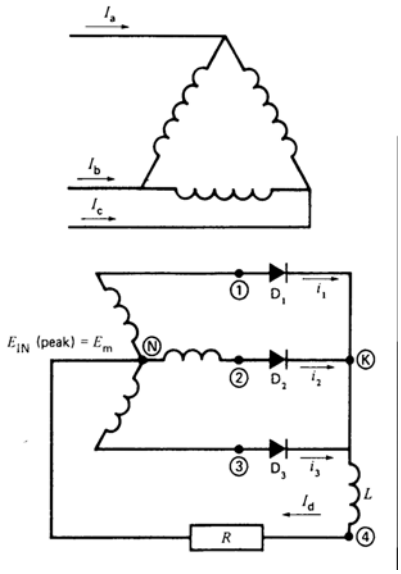


What is the dc voltage across the load?

a) 935.31V
b) 1620V
c) 540V
d) 2291V

21-3 (diode current)

The three phase transformer shown in the figure below produces a secondary line voltage of 2.4kV. The dc load current I_d is 600A.

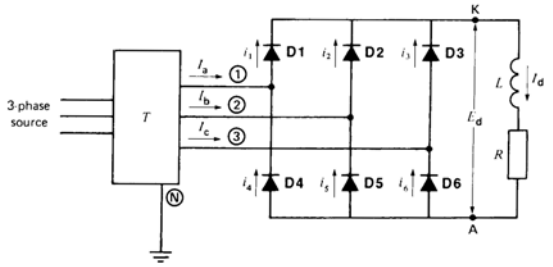


What is the average current carried by each diode?

a) 600A
b) 346.4A
c) 200A
d) 300A

21-7

The 3-phase transformer shown below produces a secondary line voltage of 2.4kV.

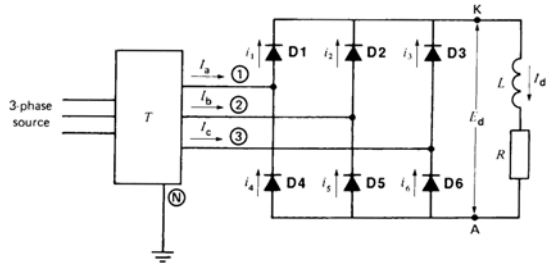


What is the dc voltage across the load?

a) 1870.6V
b) 3240V
c) 1080V
d) 4582.1V

21-7 (diode current)

The 3-phase transformer shown below produces a secondary line voltage of 2.4kV. The dc load current is 600A.

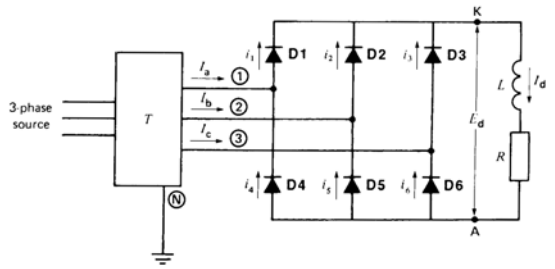


What is the dc voltage across the load?

a) 600A
b) 100A
c) 300A
d) 200A

21-7 (actually 21-11) (diode power dissipation)

The 3-phase transformer shown below produces a secondary line voltage of 2.4kV. The dc load current is 600A.

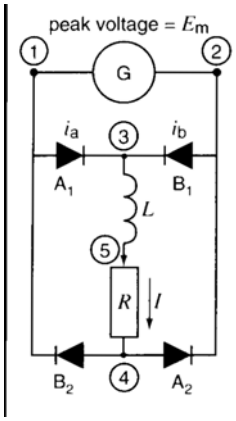


What is the power dissipated by all six diodes if the average voltage drop of each diode during the conduction period is 0.6V?

a) 2.16kW
b) 360W
c) 1.08kW
d) 720W

21-8

An ac source having an effective voltage of 600V, 60Hz is connected to a single-phase bridge rectifier as shown below.

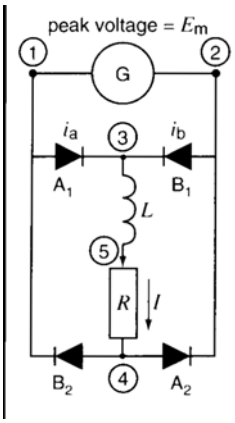


What is the voltage E_{34}?

a) 763.7V
b) 540V
c) 381.8V
d) 600V

21-8 (load current)

An ac source having an effective voltage of 600V, 60Hz is connected to a single-phase bridge rectifier as shown below. The load resistor has a value of 30Ω.

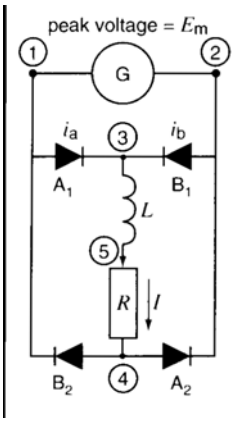


What is the dc load current I?

a) 25.5A
b) 18A
c) 12.7A
d) 20A

21-8 (diode current)

An ac source having an effective voltage of 600V, 60Hz is connected to a single-phase bridge rectifier as shown below. The load resistor has a value of 30Ω.

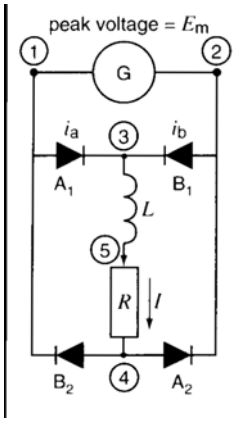


What is the average current carried by each diode?

a) 12.75A
b) 9A
c) 6.35A
d) 10A

21-8 (active power)

An ac source having an effective voltage of 600V, 60Hz is connected to a single-phase bridge rectifier as shown below. The load resistor has a value of 30Ω.

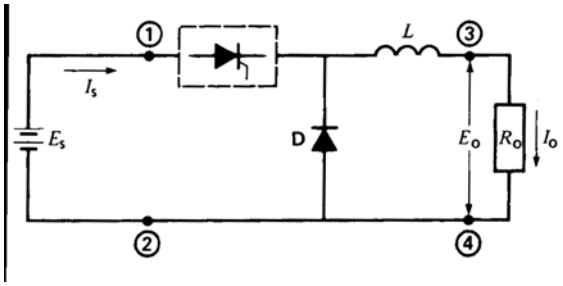


What is the active power supplied by the ac source?

a) 13.77kW
b) 9.72kW
c) 6.585kW
d) 10.8kW

21-9 (output voltage)

The chopper shown below is connected to a 3000V dc source. The chopper frequency is 50Hz and the on-time is 1ms.

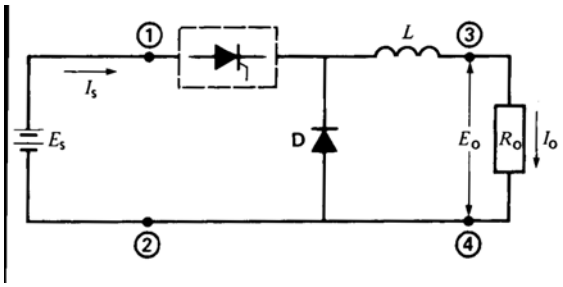


What is the voltage across R_0?

a) 60V
b) 150V
c) 50V
d) 1500V

21-9 (output current)

The chopper shown below is connected to a 3000V dc source. The chopper frequency is 50Hz and the on-time is 1ms.

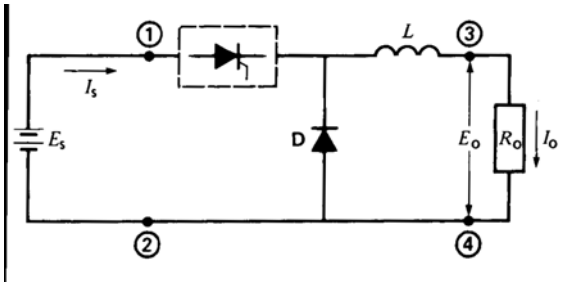


What is the value of I_o and I_s if R_0=2Ω?

a) Io = 3A and Is = 0.15A
b) I_o=75A and I_s=3.75A
c) I_o=25A and I_s=1.25A
d) I_o=750A and I_s=37.5A

21-15 (frequency)

The chopper shown below is connected to a 2000V dc source and the load resistor R_0 has a value of 0.15Ω. The on time is fixed at 100μs and the dc voltage across the resistor is 60V.

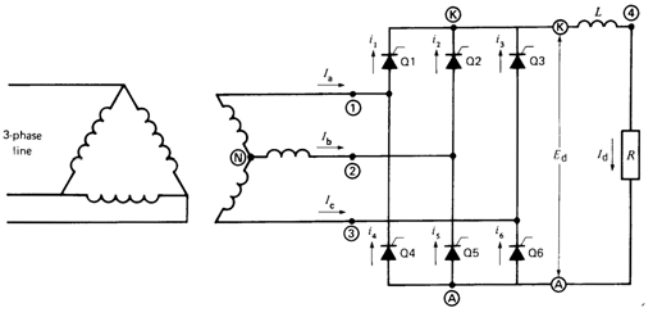


What is the switching frequency f?

a) 300Hz
b) 10kHz
c) 3kHz
d) 1kHz

21-16 (rectifier mode)

The 3-phase, 6-pulse converter shown below is directly connected to a 3-phase, 208V line.



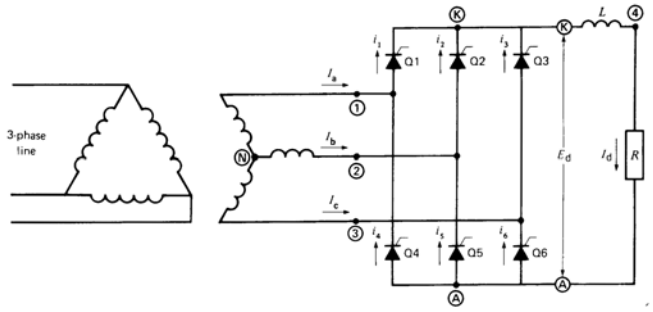
What firing angle is needed to generate 60V in rectifier mode?

a) 77.7°

b) 74°
c) 71.3°
d) 56.3°

21-16 (inverter mode)

The 3-phase, 6-pulse converter shown below is directly connected to a 3-phase, 208V line.

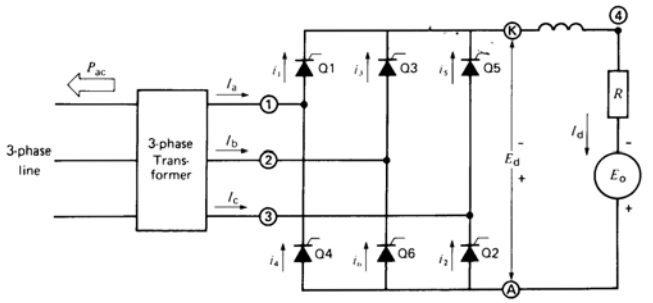


What firing angle is needed to generate 60V in inverter mode?

a) 102.3°
b) 106°
c) 108.7°
d) 123.7°

21-27

A 3-phase, 6-pulse converter shown below is to be used as an inverter. The dc side is connected to a 120V battery and R=10mΩ (L=0). The ac side is connected to a 3-phase, 120V, 60Hz line. The battery delivers a current of 500A.

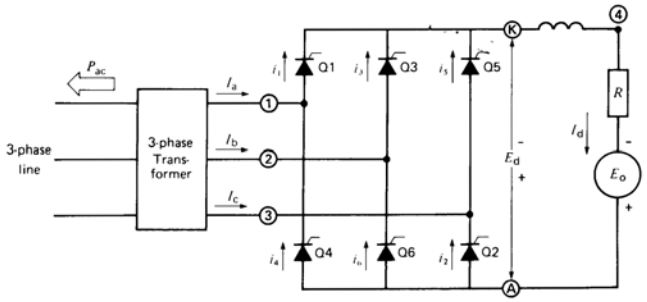


What is the firing angle?

a) 137.8°
b) 135.2°
c) 42.2°
d) 44.8°

21-27 (active power)

A 3-phase, 6-pulse converter shown below is to be used as an inverter. The dc side is connected to a 120V battery and R=10mΩ (L=0). The ac side is connected to a 3-phase, 120V, 60Hz line. The battery delivers a current of 500A.

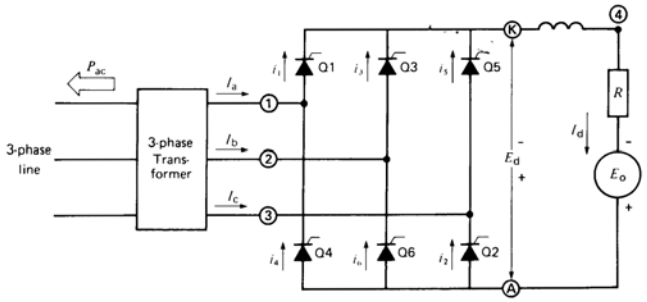


What is the active power delivered to the ac line (neglecting the transformer losses)?

a) 60kW
b) 42.4kW
c) 57.5kW
d) 84.85kW

21-27 (reactive power)

A 3-phase, 6-pulse converter shown below is to be used as an inverter. The dc side is connected to a 120V battery and R=10mΩ (L=0). The ac side is connected to a 3-phase, 120V, 60Hz line. The battery delivers a current of 500A.



What is the reactive power delivered to the ac line?

a) 57.1kVAr
b) 52kVAr
c) 0VAr
d) 93.5kVAr