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Question No : 01

Answer:

* 1-ϕ half wave and full wave bridge Rectifier:

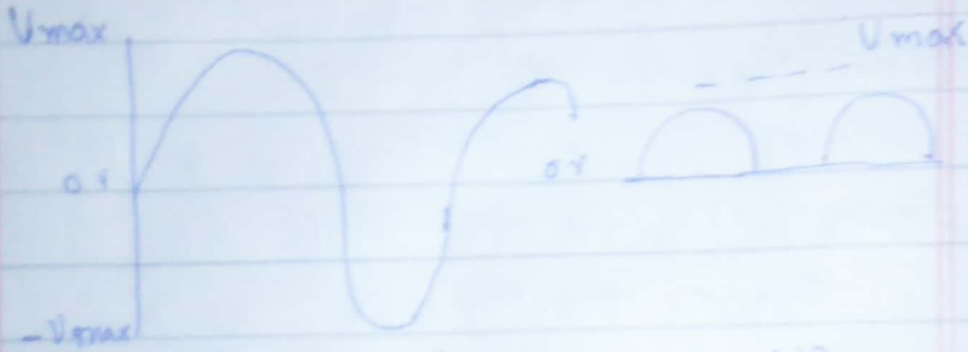
→ Half wave rectifier which convert only one half of the AC cycle into pulsating DC while full wave rectifier is an electronic circuit which converts entire cycle AC into pulsuting DC.

→ Half wave utilize only half of AC cycle for the conversation while full wave utilize full wave of AC cycle.

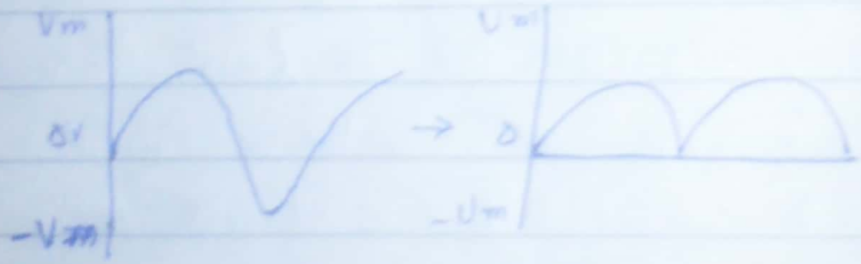
→ Half wave is unidirectional the conversation is one directional only either convert positive or negative, that why called half wave. While full wave is bidirectional

It conduct Positive half as well as negative half cycle.

→ Output wave form of single phase halfwave rectifier



→ single Phase full wave rectifier



→ Numer of diode in halfwave is 1 while in fullwave is 4.
→ Both utilize single phase for operation.
→ Peak inverse voltage of single halfwave and full wave rectifier are same.

* 1-φ Uncontroll & controll rectifier (D & S):

→ Uncontroll are naturally turn on whenever opposititive valtage is applied b/w its terminal and when you stop by applying it valtages become negative.

→ Uncontroll rectifier is a diode

→ It has two terminals and will only allow flow in one direction only. While a controll rectifier has a third connection that controls at which point the rectifier will work.

→ Controll rectifier does not become conducting immediately after its voltage has become positive.

→ It requires triggering by means of gate pulse signal.

Question No: 02

Solution:

$V_m = 53V$

$R = 50\Omega$

we know that

For half wave

1) Vdc

$\Rightarrow \frac{V_m}{\pi}$ — ①

where $V_m = 53V$

$\pi = 3.14$

Putting values in ①, we get

$\frac{53}{3.14} = 16.87V$

For Full wave

$\Rightarrow \frac{2V_m}{\pi}$ — ②

where $V_m = 53V$

$\pi = 3.14$

Putting values in ②, we get.

$\frac{2(53)}{3.14} = 33.7V$

2) Idc

For half wave

$I_{dc} = \frac{V_m}{\pi R}$

putting values, we get

$$\frac{53}{(3.14)(50)} = 0.33\ A$$

For full wave

$$I_{dc} = \frac{I_m}{\pi} \quad \text{where } I_m = V_m/R$$

$$I_m = \frac{53}{50} = 1.06$$

Putting value of Im in above eq, we get

$$\frac{1.06}{3.14} = 0.3\ A$$

3) Vrms

For half wave $V_{rms} = \frac{V_m}{2}$

$$= \frac{53}{2} = 26.5V$$

For Full wave

$$V_{rms} = \sqrt{2}\ V_s$$

where $V_s = \frac{V_m}{\sqrt{2}}$

$$V_s = \frac{53}{\sqrt{2}}$$

$$V_s = 37.4\ V$$

Now put values

$$V_{rms} = \sqrt{2} \cdot 37.4$$

$$V_{rms} = 52.8\ V$$

4) Irms

For half wave

$$I_{rms} = \frac{V_m}{2R}$$

$$I_{rms} = \frac{53}{2(50)}$$

$$I_{rms} = 0.53A$$

For full wave

$$I_{rms} = \frac{I_m}{2}$$

where $I_m = \frac{V_m}{R}$

$$I_m = \frac{53}{50}$$

$$I_m = 1.06$$

$$I_{rms} = \frac{1.06}{2}$$

$$I_{rms} = 0.53A$$

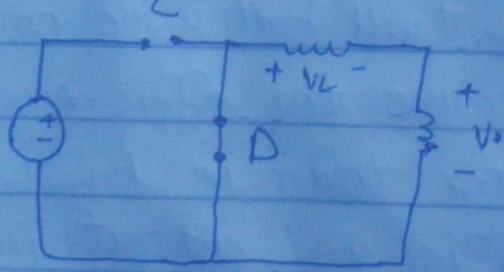
5) The uncontroll Full wave bridge rectifier because the efficiency of it, is better than in half wave bridge rectifier and output frequency is also greater than half wave rectifier.

Question No: 03

Solution:

Principals And Working Of Buck converter:

The main working principle of buck convertor is that the inductor in the input circuit resists sudden variations in input current. When switch is ON the inductor store energy in the form of magnetic energy and discharges it when switch is CLOSED. The capicator in the output circuit is assumed larger enough that the time constant of RC circuit in the output stage is high. the Large time constant compared to switching period ensures a constant output voltage.



Data:

$V_{in} = 50V$

$V_{out} = 53\%$

$R = 50\Omega$

Frequency = 20 KHz

1) Vout

we know that

$V_{out} = D \times V_s$

which is 53% = 0.53

putting values, we get

(0.53)(50)

= 26.5V

2) Iout

$I_{out} = \frac{V_o}{R}$

$= \frac{50}{50}$

$I_{out} = 1A$

3) Iin

we know that

$I_o = \frac{I_i}{D}$

$I_i = I_o \times D$

$I_i = 1 \times 0.53$

$I_i = 0.53A$

4) Inductor(L)

$L = \frac{RT_{OFF}}{2} \times R$ Let suppose $T_{OFF} = 0.004$

$L = \frac{0.004}{2} \times 50$

$L = 0.1 H$

Question No: 04

Solution:

Working Principle Of Boost converter:

A boost converter is one of simplest types of switch mode converter. It takes an input voltage and boost or increase it. It is less cumbersome than an AC transferomer or inductor It has high efficiency upto 99%. means output voltage is greater than input voltage.

The main working principle of boost converter is that the inductor in the input circuit resists sudden variation in input current. When switch is OFF the inductor stores energy in form of magnietic energy and discharges when it switch is CLOSED.

Data:

$V_{in} = 50V$

$D = 53\%$

$R = 50$

Frequency = 20 kHz

1). Vout

we Know that

$Vout = D \times Vs$

$Vout = (0.53)(50) = 26.5V$

2). Iout

$I_o = I_i(1-d)$

$I_o = 1.2644(1-0.53)$

$I_o = (1.2644)(0.47)$

$I = 0.594\ A$

3). Iin

$I_i = \frac{V_i}{(1-d)^2} \times \frac{1}{R}$

$I_i = \frac{50}{(1-0.53)^2} \times \frac{1}{50}$

$I_i = 1.2644\ A$

4). Inductor L

$L = \frac{R\,T_{ON}}{2}(1-d)^2$

$d = \frac{T_{ON}}{T}$

$T_{ON} = 0.53 \times 0.0104$

$T_{ON} = 0.005$

$L = \frac{R\,T_{ON}}{2}(1-d)^2 \Rightarrow L = \frac{50(0.005)(1-0.0224)^2}{2}$

$L = 0.124H$

Question No: 05

Solution:

Working Principle of Buck Converter:

The main working principle of Buck converter is that the inductor in the input circuit resists sudden variations in input current. When switch is ON the inductor stores energy in form of magnetic energy and discharges it when switch is CLOSED.

Data:

$V_{in} = 50v$

$V_{out} = 53\%$

$R = 50\Omega$

Frequency = 20KHz

1) Duty cycle (D)

we know that

$$\frac{V_o}{V_i} = \frac{-D}{1-D}$$

$$V_o = +V_i \frac{d}{1-d}$$ putt values

$$0.53 = +50 \frac{d}{1-d}$$

$(0.53)(1-d) = 50d$

$0.53 - 0.53d = 50d$

$0.53 = 50d + 0.53d$

$0.53 = 50.53d$

$\frac{0.53}{50.53} = \frac{50.53\,d}{50.53}$

$d = 0.0104$

2). Iout

we know that

$$I_{max} + I_{min} = \frac{2dv}{R(1-d)^2}$$

$$I_{max} + I_{min} = \frac{2(0.0104)(50)}{50(1-0.0104)^2}$$

$$= 0.0212$$

we know that

$$I_{out} = \frac{I_{max} + I_{min}}{2}$$

$$= \frac{0.0212}{2}$$

$I_{out} = 0.0106\,A$

3). Inductor:

$$L = \frac{RTd}{2}(1-d)^2$$

Putting values where $T = 1/f$

$T = 1/20 \times 1000 \Rightarrow T = 0.0005$

$$L = \frac{50(0.00005)}{2}(1-0.0104)^2$$

$$L = 0.124\ H$$

The END