Resistors

1. Linear resistor
2. Non linear resistor
A-photo resistors
B-thermostats
C-voltage-dependent resistors
1. Linear resistor (obeys ohms law)
R=I /V, Ω, KΩ, MΩ
*Power rating (wattage) W=V*I=I²*R. (1/8W, 1/4W,……..1)*

**-COLOUR CODING*

Color	figure	Tolerance(percent)
Black	٠	
BROWN	١	
RAD	٢	
ORANGE	٣	
YELLOW	٤	
GREEN	٥	
BLUE	٦	
VIOLET	٧	
GREY	٨	
WHITE	٩	
SILVER		±%٥
NONE		±%٢٠
GOLD		±%١٠

ResistorΩ=first colour +second co lour*10^third color ±fourth color

$R=18*10^2 \pm 5\%$

2-CAPACITORS

The ability of capacitor to store energy is called (capacitance)

**** capacitance, C=charge Q/charge V,C=€A/d***

C, $\mu F=1*10^{-6}$ FARAD , $n f=1*10^{-9}$ FARAD

$Pf=1*10^{-12}$FARAD
€=dielectric constant of insulator
A=area of plat
d=distance between two plates

VOLTAGE RATING

The maximum voltage that can applied between the plates of a capacitor without

STOED ENERGY IN CAPACITORS

Energy (Joules) $=\frac{1}{2}CV^2$

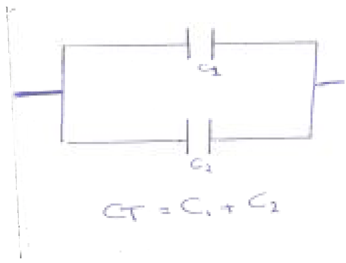
TYPES OF CAPACITORS

A-NON-ELECTROLYTIC (not polarized)
B-ELECTROLYTIC (polarized)

SERIES CONNECTIONS

$Ct=1/C_1+1/C_2 1/$

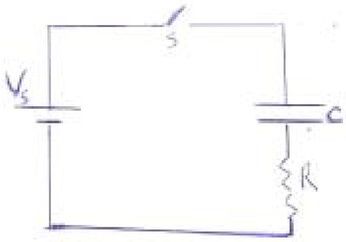
PARALLED CONNECTION



$C_t=C_1+C_2$

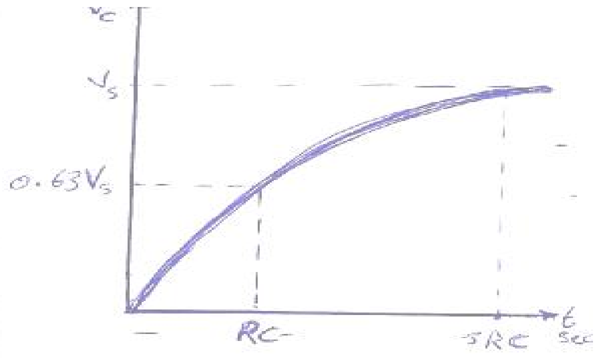
CHARGING AND DISCHARGING CAPACITOR

A) - CHARGING CAPACITORS



The capacitor may be charged from a D.C supply (V_S) to a (V_c)

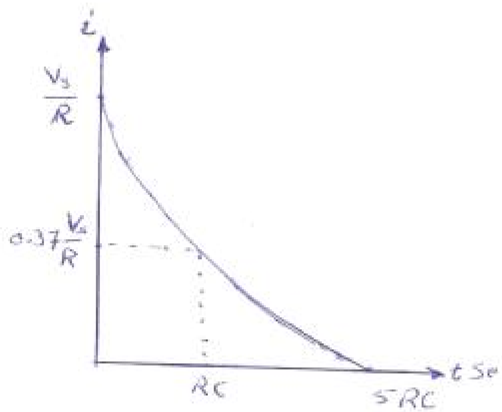
$V_C=V_S\,(1-\exp{-t/RC})$ RC=time constant= (τ)
$RC=V/I * Q/V=Q/(Q/t)$ =sec



after $t = \tau = RC$

$V_c=0.63V_s$
after $t = ٥RC$ $= V_c \approx V_s$

B) - CHARGING CURRENT



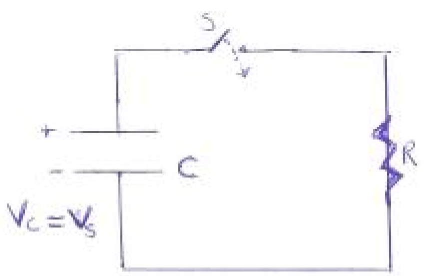
$I = Vs / R \exp-(t / RC)$

After $t = \tau = RC$

$i = 0.37 Vs / R$

after $t \approx 5RC$ $i \approx 0$

B) DISCHARGING CAPACITOR



After the process to Vs, the discharge will take the form:

$V_c = Vs \exp -t / RC$

(Voltage a cross the capacitor)

$i = Vs / R - \exp t / Rc$

(Discharge current in the discharge circuit)

*The discharge &the charge frequency of the circuit is related to the (τ)

$F_{HZ} = 1 / \tau$

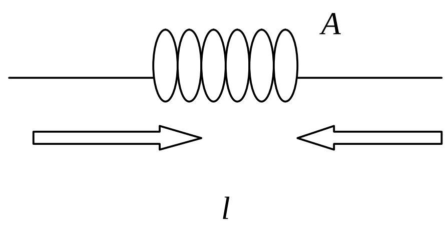
*INDUCTORS & TRANSFORMERS:

1-SELF- INDUCTANCE. Is the property in which e. m .f is produced when a charging current flows in the circuit or component.

e .m .f, $C = -n\,(d\,\Phi / d\,t) = -L\,(d\,I / d\,t)$….faraday's law

THES, the self- inductance $L = N\,(d\,\Phi / d\,t)$

$L = \mu_\circ\,\mu r\,AN^2 / l$ (coil)



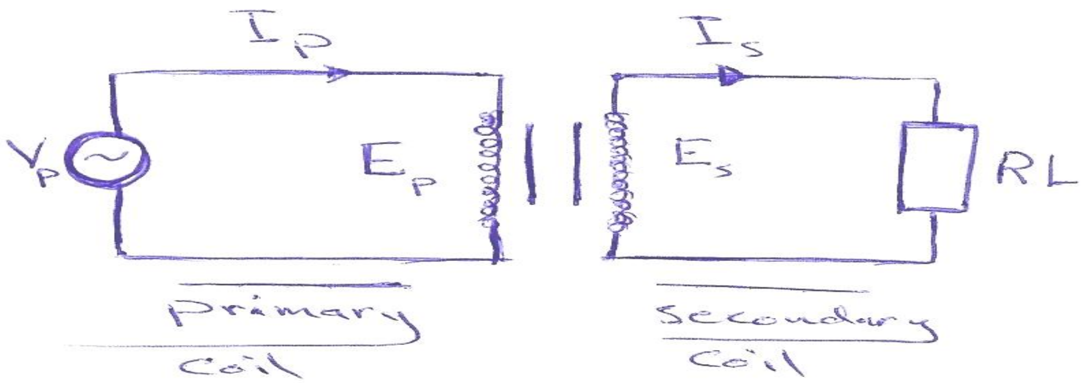
Where μ∘ μr = μ (permeability of the core).
(μ) is the ability of a material to conduct magnetic flax (permeability)
N is the number of turns of coil
A is the cross sectional area of coil
L is the length of coil

2-MUTUAL INDUCTANCE

Two circuits are said to possess mutual inductance it a charging current in one circuit gives rise to charging magnetic flax, which links with the second circuit, causing an e. m .f to be induced in the second coil

3-TRANSFORMERS

The transformers are used either step-up transformer or step down transformer.
step-up Vs↑, Is↓
step-down Vs↓, Is↑



transformation ratio, N= (V p ⁄ V s) = (N p ⁄ Ns)
= (I s ⁄ I p)

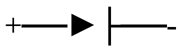
٤ -IDEAL DIODE:

The ideal diode, is an open circuit in reverse biasing and is a short circuit in forward biasing

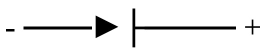
short circuit

open circuit

a) forward biasing



b) Reverse biasing



5- REAL DIOED:

1) –CURRENT- VOLTAGE CHARACTERISTIES OF DIODES

*the diode current can be related to the applied Voltage on the temperature with the following equation

Id=Is (exp (KV / T) - 1)

Where I s= reverse current saturation

K= 11600 / ٦ ,

٦=1 for G e diode & 2 for S i diode

V=the applied voltage (+) for forward biasing & (-) for reverse biasing

2) - DC OR STATIC RESISTANCE OF DIODE (R dc)

$R_{dc} = V_D / I_D \ \Omega$

3) - AC OR DYNAMIC RESISTANCE OF DIODE (R AC)

$R_{AC} = \Delta V_D / \Delta I_D \ \Omega$

C) –DIODE SPECIFICATION:

The specifications of semiconductor diode are

1- The maximum forward voltage $V_{f\,max}$

2- The maximum forward current $I_{f\,max}$

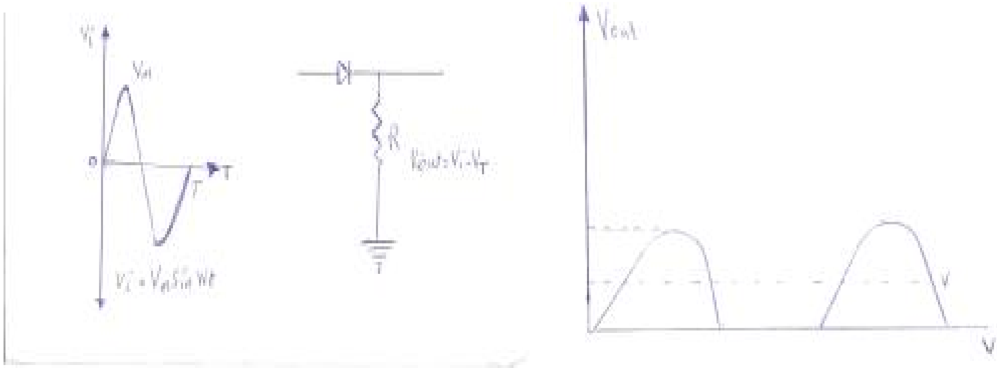
3- The maximum reverse current IR max

D-Diode applications:

A- half-wave Rectification
B-full-wave   Rectification

1- Rectification.

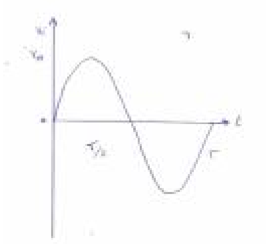
A- half-wave Rectification.

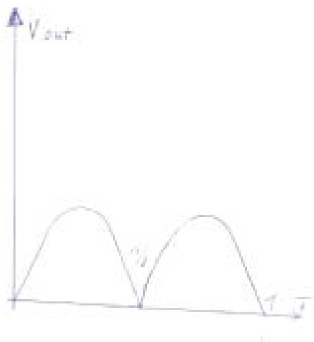


V d.c=0.318 Vm -Vt

PIV Rating = Vm

b- full-wave Rectification.





1 – Bridge Rectification

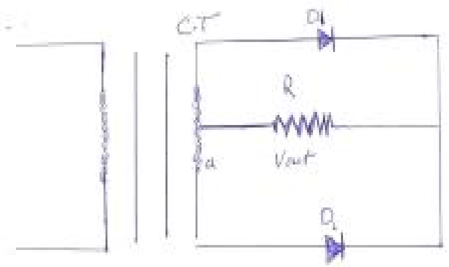
**during the period*
T= 0 to t / 2 D2, D3 (short)

**during the period*
T= t/2 to t D1, D 4 (short)
D2, D 3 (open)

V dc = 0.636 (Vm-2Vt).

PIV = V m

2- full-wave Rectification with center-tapped transformer



** The potential at point (a) = zero (center the secondary coil).*

**during the negative port (0→T/2)*	*D2 (short)* *D 1(open)*
**during the positive port (T/2→T)*	*D 1(short)* *D 2(open)*

$V_{d.c} = 0.636\,(V_m - V_t)$

$PIV = 2V_m$

2-Clippers

The diode networks that have the ability" clip" of apportion of the input signal without distorting the remaining part of the alternating wafer.

A-Series

b- Parallel

3- Clampers.

The diode network that will "Clamp" a signal to a different DC level

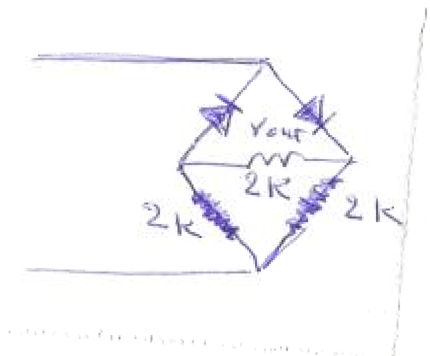
Examples

1- Sketch (V out) for each networks (ideal diode)

A-

B-

2- Determine the output wave from for the network



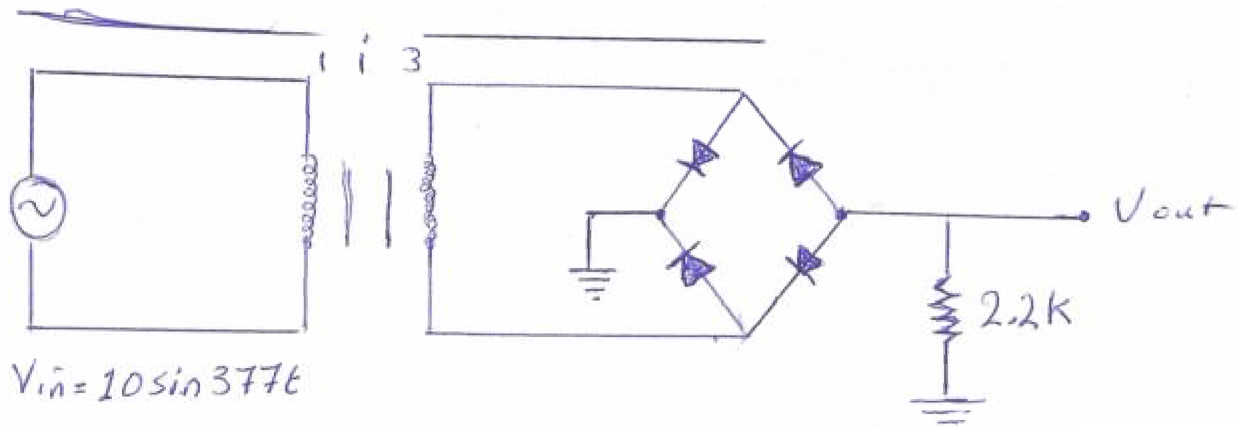
3- A full-wave bridge rectifier with a 20 V r. M .s sinusoidal input has a load resistor of 1kΩ

a- if silicon diode employed, what is the (D C) voltage an available at the load.

b-determine the required PIV rating of each diode.

c- Find the maximum current through each diode during conduction

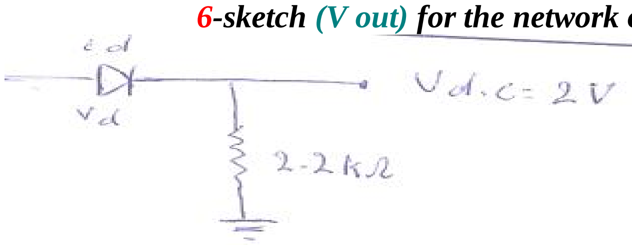
4- Determine (V out) and the required PIV rating of each diode for the network

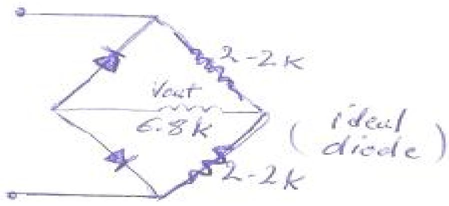


5- Assuming an ideal diode, sketch VI, VD and Id for the half-wave rectifier of the figure. The input is a sinusoidal waveform with a frequency of 60 Hz

****repeat (Q5) with a silicon diode (V t = 0.7).***

6-sketch (V out) for the network of fig and determine the DC voltage viable





4-Filtering

The o/p voltage from bridge rectifier or half-wave rectifier is not pure DC voltage to increase the DC component in the o/p wave for a capacitor must be used.

**** The pulse period $T = 1/F_{out}$ $F_{out} = 2 F_{in}$***

****for good DC (nearly pure DC) $RLC \geq 10 * T$***

****$V_{DC} = [1- (0.00417/RLC)] * V_p$***

Where VDC is the o/p DC voltage, V p is the peak a flow the bridge rectifier

****the ripple voltage***

$$V_r = 0.0024\, V_p / R_l C \qquad r.m.s$$

**** The important parameter in Dc power supply. Is the ripple factor (r)***

$$r = (V_r / V_{DC}) * 100\ \%$$

e x:⁄for the circuit in fig (a) if the $V_p = 30$v, find the VDC and the ripple voltage

e x:⁄design voltage mode power supply with the following characteristics

A- Output voltage 10V?

b- Output current 1 A?

c- Ripple factor 5%?