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4. In this case, the radioactive nucleus is already unstable and finally turns into stable nucleus.

4. In this case, the stable nucleus turns into unstable nucleus.

Semiconductor device.

(silicon because its tolerance is high Eg:- Germinium)

P-N junction (or semi-conductor diode)

Semi conductor having half pentavalent dropping and half trivalent doping is known as P-N junction.

The region where the two doped region meet is called P-N junction At the instant of junction formation, free electron on N-side drift towards P-side and vice

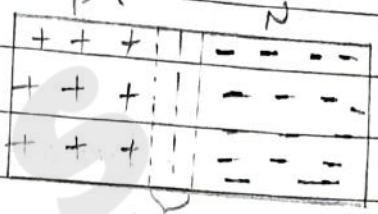

fig (1)

and near the junction they combine and there are some region near the junction gets deflected from holes and free-electrons these region is called deflection region. Potential difference developed across deflection region is called potential barrier denoted by V_B. It value is 0.3 ev for (Si) diode and 0.7 volt for (Ge) diode.

Fig (2) shows the circuit symbol of P-N diode,


fig (2)

Characteristics curve for P-N diode.

Connection of battery in a circuit is called biasing.

4) If positive terminal of battery is connected to P-side and negative terminal of battery is connected to N-side then it is called forward biasing.

4) If positive terminal of battery is connected to N-side and negative terminal of battery is connected to P-side then it is called negative biasing,

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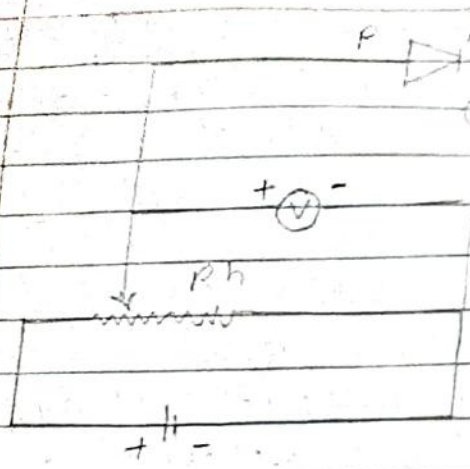

fig ① forward biased diode

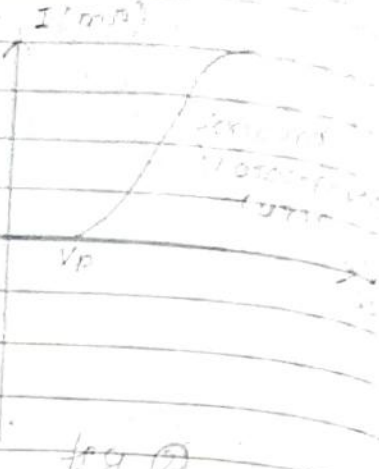

fig ②

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fig ① shows the circuit diagram of forward based diode and fig ② shows the voltage current graph which is forward characteristics curve. Initially when forward voltage (V) increases the current does not flow in the circuit at a certain voltage V_K the current starts flowing in the circuit. This voltage V_K is known as knee voltage.

fig ③ below shows the circuit diagram to draw reverse characteristics of PN diode and fig ④ shows reverse characteristics.

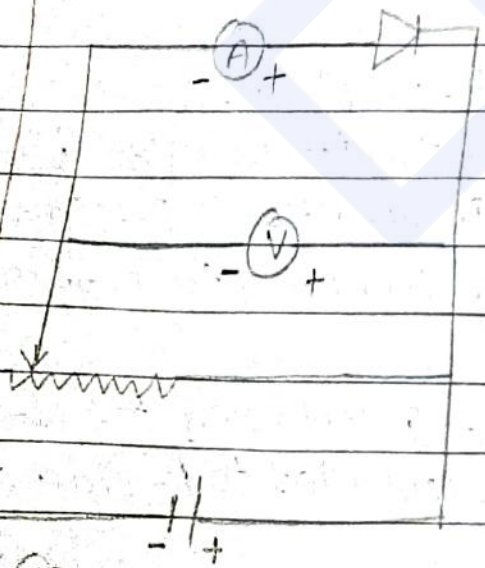

fig ③

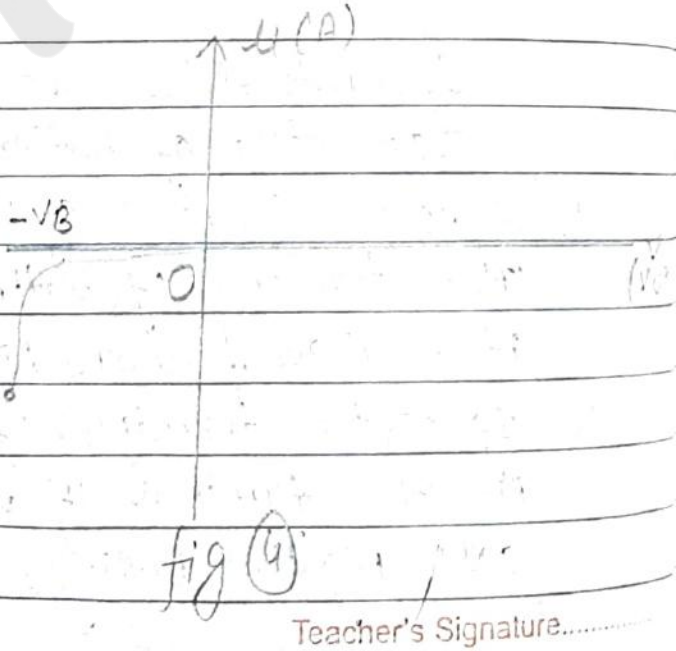

fig ④

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Initially, the reverse current is very small but when the reverse voltage reaches to certain value, the reverse currents suddenly increase due to breaking of covalent bonds by very high electric field. This voltage is known as break down voltage.

→ (PN diode is never used in reverse biasing because it gets fused / damaged due to very high current)

Application of PN junction diode as rectifier

The electronic circuit that converts AC into DC is known as rectifier.

① Half wave rectifier

When 1 PN diode is connected to the output of a transformer then only half wave of input AC is rectified and the circuit is known as half wave rectifier. Fig ① below shows the circuit diagram of half wave rectifier. Fig ② shows the input and output voltages.

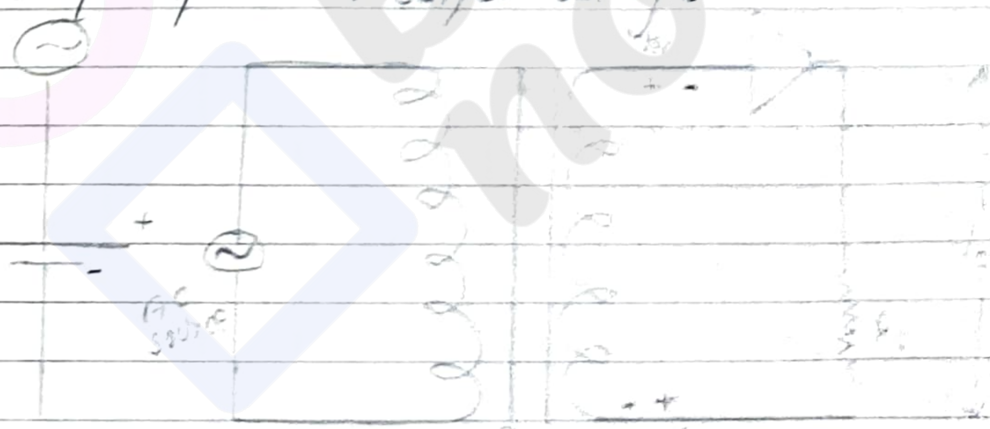

Fig ① circuit of HWR

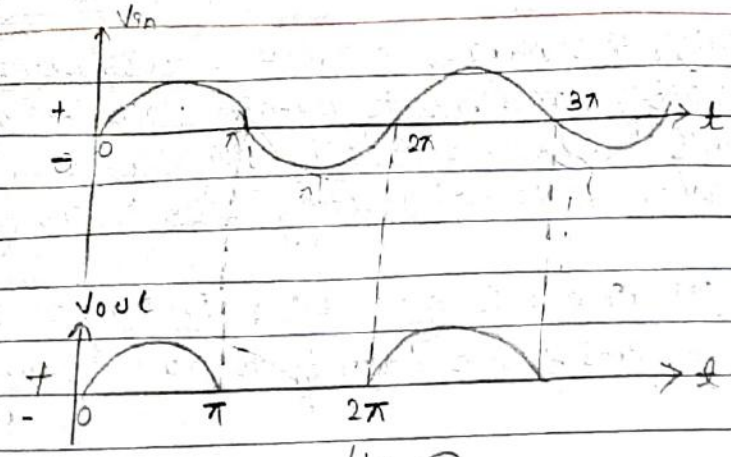

fig ②

During +ve half cycle of Input AC Pf upper end of secondary of transformer PS +ve and lower end Ps -ve then dPode Ps forward bPased from 0 to π of Input, hence dPode conducts from 0 to π Pn load resistance R_L. ~~During nex~~

During next -ve half cycle the polarity reverses and dPode gets reverse bPased hence does not conduct for π to 2π and soon - Hence the output has half wave unPdirection (i.e rectified)

② Full wave rectPfier (FWR) :- (2 - dPode).

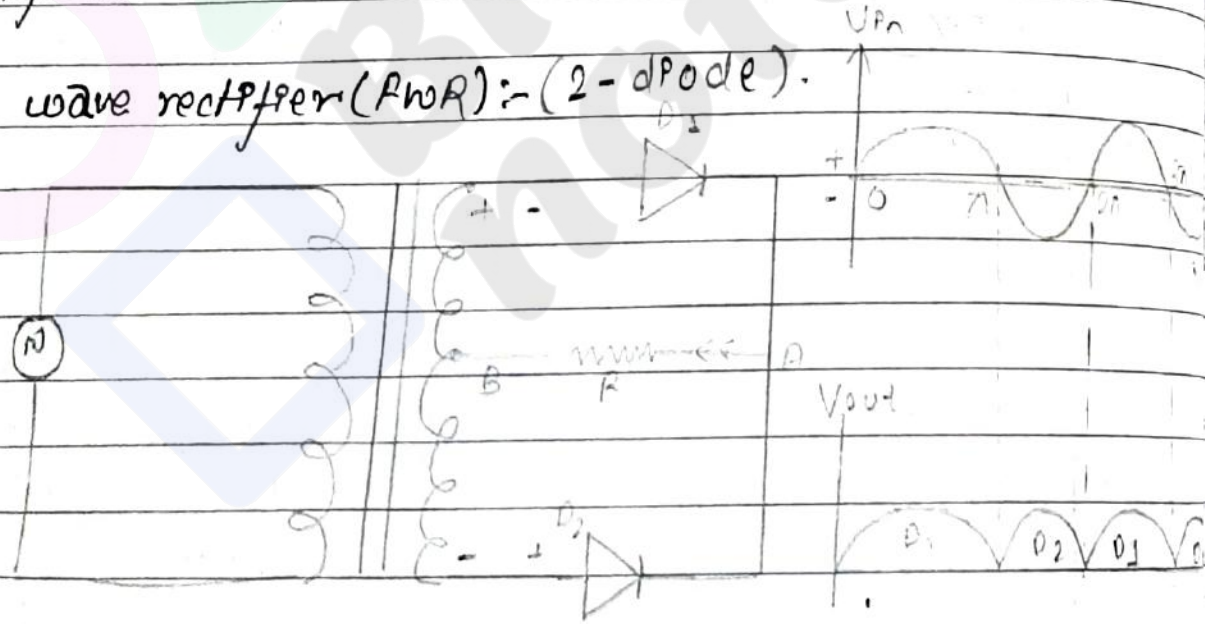

fig ③ circuit of full wave rectifier.

fig ④ Input and output of full wave rectifier

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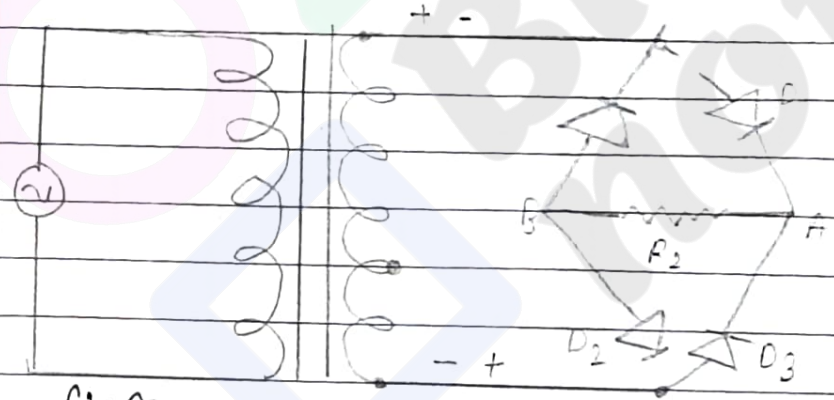
fig(3) shows full wave rectifier using 1 connected two diode D_1 and D_2. and fig(4) shows the input and output signals of full wave rectifier.

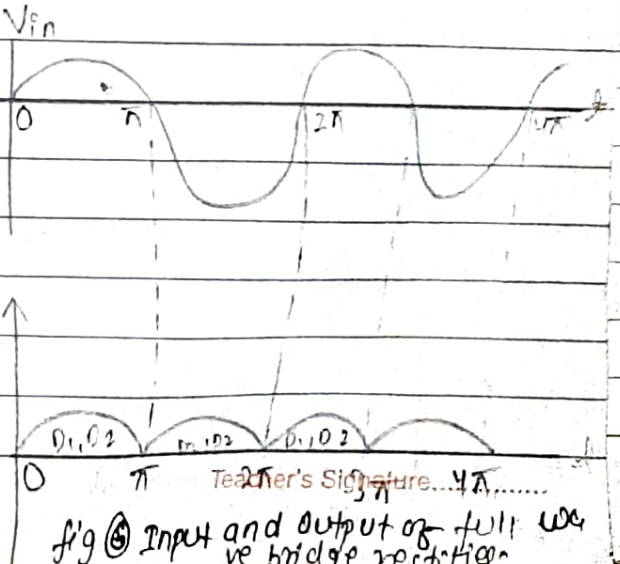
During the +ve half cycle of input AC. let the upperend of secondary of transformer is +ve and lower end is negative. then diode (D_1) will be forward biased and will conduct through load resistance along AB. while diode (D_2) be in reversed biased does not conduct. for the next -ve half cycle the polarity reverses, D_2 gets forward biased and conduct through load resistance (R_1) along AB while diode D_1 being reversed biased does not conduct from π to 2π and so on.

Thus, the output has full wave rectified (i.e unidirectional

* Full wave bridge ~~recif~~ rectifier



fig(5) circuit of full wave bridge rectifier.



fig(6) Input and output of full wave bridge rectifier

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DC → AC = USI
AC → DC = rectifier

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In full wave rectifier. 4 diodes D_1, D_2, D_3, D_4 nnected to the secondary of transformer along with esistance R_L in the form of a bridge as shown in fig

During the half cycle of input AC if upper end of ndary of transformer is +ve and lower end is -ve then 2 get forward biased and conduct through R_L along AB. D_3, D_4 being reversed biased do not conduct.

Now, in the next -ve half cycle of input AC arity reverses making D_3, D_4 forward biased and D_1, D_2 erse biased. So D_3, D_4 conduct through R_L along AB d D_1, D_2 does not conduct.

thus output is unidirection (i.e rectifier)

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1 → on
0 → off
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Logic gates:-

The electronic circuit that gives the output corresponding to different input is called logic gates. It can have one or more inputs but only one output

OR gate:-

OR gate has two or more inputs but only one output. The output is high (1) when one or more inputs are high. Fig (1) below shows the logic symbol of two input OR gate and table (1) shows its truth table.

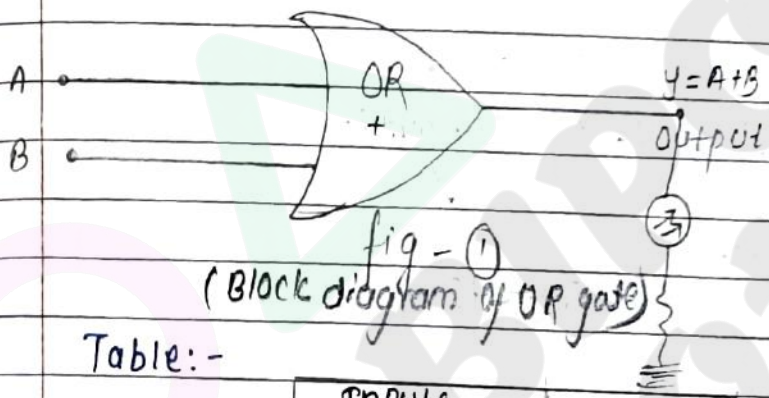

fig - (1)
(Block diagram of OR gate)

Table:-

Inputs		Outputs
A	B	
0	0	0
0	1	1
1	0	1
1	1	1

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AND
NOT
OR

BASIC GATES

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AND gate:-

And gate is a logic gate that can have two or more inputs but only one output. The output is high only when all inputs are high.

Fig ① shows the block diagram of two input AND gate and Table 1 shows its ~~thru~~ truth table.

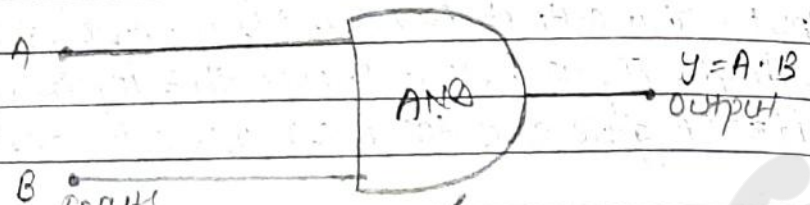

fig:- ① (Block diagram of AND gate)

Table 1; Truth Table of AND gate:-

Inputs		Outputs
A	B	
0	0	0
0	1	0
1	0	0
1	1	1

NOT gate:-

NOT gate is a logic gate which has one input and only one output. The output is the inverted input.

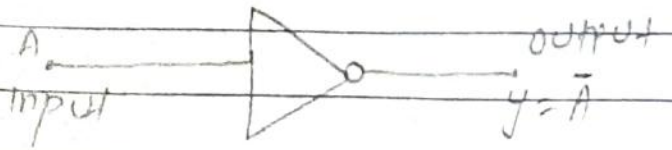

fig ② Block diagram of NOT gate.

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Table 2: Truth table of NOT gate:-

Input A	Output $y = \bar{A}$
0	1
1	0

* NAND GATE:-

AND gate followed by NOT gate is called NAND gate. It may have two or more inputs but only one output i.e. the output is low only when all inputs are high (1). fig (3) shows the block diagram of two inputs NAND GATE and table (3) shows its truth table.

fig- 3 (Block diagram of NAND GATE)

Table 3: Truth table of NAND GATE.

Inputs		Outputs
A	B	
0	0	1
0	1	1
1	0	1
1	1	0

NOR GATE:- OR gate followed by NOT gives or called NOR gate. It may have two more inputs but only one output

fig (4) shows block diagram of two inputs NOR gate and table (4) shows its truth table.

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Output is high only when all inputs are low.

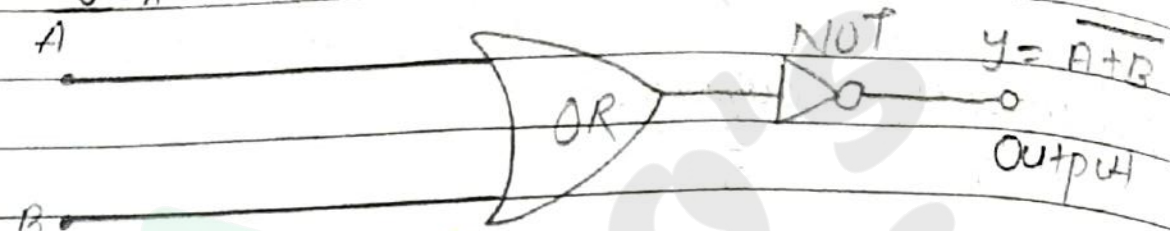

Fig:- 4 (Block diagram of NOR GATE)

Table 4:- Truth Table of NOR GATE.

Inputs		Outputs
A	B	
0	0	1
0	1	0
1	0	0
1	1	0