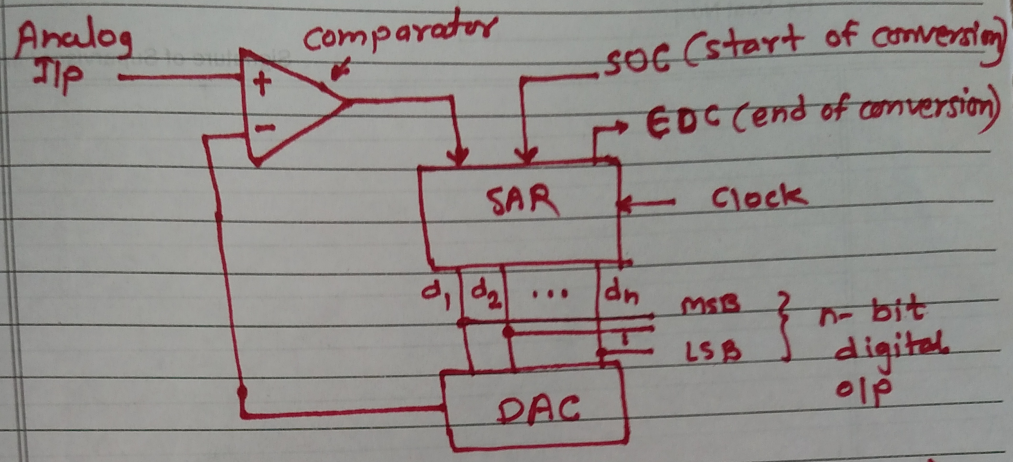
① Successive Approximation ADC (SA-ADC)




Block diagram of (SA-ADC)

It is most widely & popularly used ADC technique.

ADC operation is based upon an efficient 'code search' strategy. n-bit conversion is completed in just n-clock period.

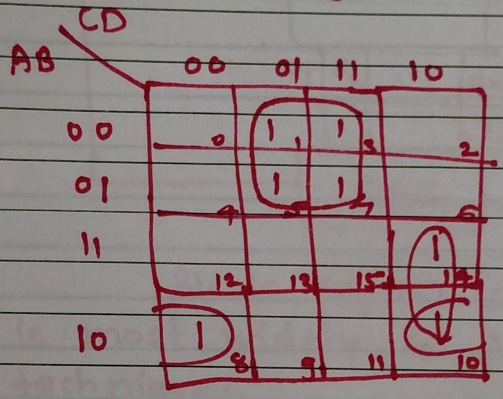
It's conversion time is constant & independent of amplitude of analog signal. But circuit is complex.

② Compare R-2R & weighted resistor DAC.

| Sr. No. | Parameter | Weighted Resister | R-2R ladder |
|---|---|---|---|
| 1 | Simplicity | simple | some complicated. |
| 2. | resistor | wide range is required | only two values are required |
| 3. | no. of resistor per bit | one | Two |
| 4 | expansion | Not easy to expand | Easy to expand |

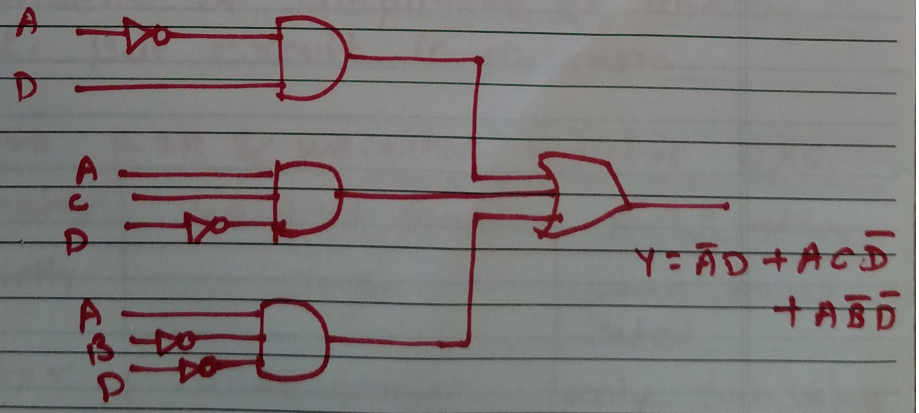
(5) Minimize equation using k-map
$Y = \Sigma m (1, 3, 5, 7, 8, 10, 14)$
& Draw logic diagram for it.

Simplification using K-map:




$$Y = \bar{A}D + AC\bar{D} + A\bar{B}\bar{D}$$

logic diagram



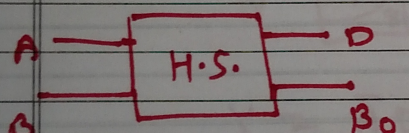
(3) Sop equation $Y = ABC + A\bar{B}\bar{C}$

Each individual term is called minterm

pos equation $Y = (A+B) \cdot (A+\bar{B})$

each individual term is called maxterm.

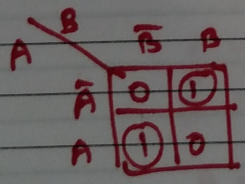
(4) Design- Draw Block diagram of half subtractor & its truth table.



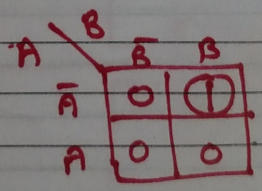

Block diagram of H.S.

| I/Ps | | O/P | |
|---|---|---|---|
| A | B | Difference | Borrow |
| 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 |

For D o/p




For B o/p

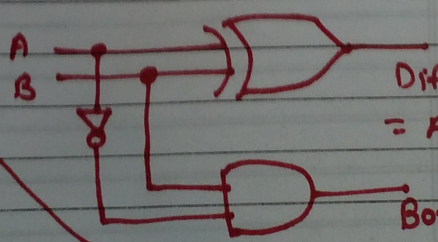



$D = A\bar{B} + \bar{A}B$

$= A \oplus B$

$B = \bar{A}B$

Logic diagram




(* same procedure for ~~HalA~~ Half Adder only in place of subtraction it is addition)

# 3. Combinational logic Circuits

(1) Convert equation $Y = AB + A\bar{C} + BC$ into canonical SOP form.

① find missing literal (variable) for each term :

$Y = AB + A\bar{C} + BC$

(C) (B) (A)

② AND each term with (missing variable + its complement)

$Y = AB \cdot (C + \bar{C}) + A\bar{C}(B + \bar{B}) + BC(A + \bar{A})$

③ Simplify the equation

$Y = ABC + AB\bar{C} + AB\bar{C} + A\bar{B}\bar{C} + ABC + \bar{A}BC$

$= (ABC + ABC) + (AB\bar{C} + AB\bar{C}) + \bar{A}BC + A\bar{B}\bar{C}$

But $A + A = A$ $\quad \therefore ABC + ABC = ABC$

$\therefore Y = ABC + AB\bar{C} + \bar{A}BC + A\bar{B}\bar{C}$

It is canonical sop form, each term contains all variables.

(2) Convert equation into canonical pos form.

$Y = (\bar{A} + B)(B + \bar{C})(\bar{A} + \bar{C})$

Soln : $Y = (\bar{A} + B + C\bar{C})(B + \bar{C} + A\bar{A})(\bar{A} + \bar{C} + B \cdot \bar{B})$

But $A + BC = (A + B)(A + C)$

$\therefore Y = (\bar{A} + B + C)(\bar{A} + B + \bar{C})(B + \bar{C} + A)(B + \bar{C} + \bar{A})$

$(\bar{A} + \bar{C} + B)(\bar{A} + \bar{C} + \bar{B})$

$\therefore Y = (\bar{A} + B + C)(\bar{A} + B + \bar{C})(A + B + \bar{C})(\bar{A} + B + \bar{C}) \cdot$

$(\bar{A} + B + \bar{C})(\bar{A} + \bar{B} + \bar{C})$