# TYPES OF ROM:

- Mask ROM.
- Programmable ROM(PROM).
- Erasable ROM(EROM).
- Ultravoilet EPROM(UV PROM).
- Electrically Erasable PROM(EEPROM)

- Assignment: Discuss each type of ROM in brief.

# Programmable Array Logic(PAL):

- PAL is programmable array of logic gates on a single chip.
- The basic PAL consists of a programmable AND array and fixed OR array with output logic as shown in block diagram below.
- PAL is most common one time programmable(OTP) Logic device and is implemented with bipolar technology(TTL or ECL)

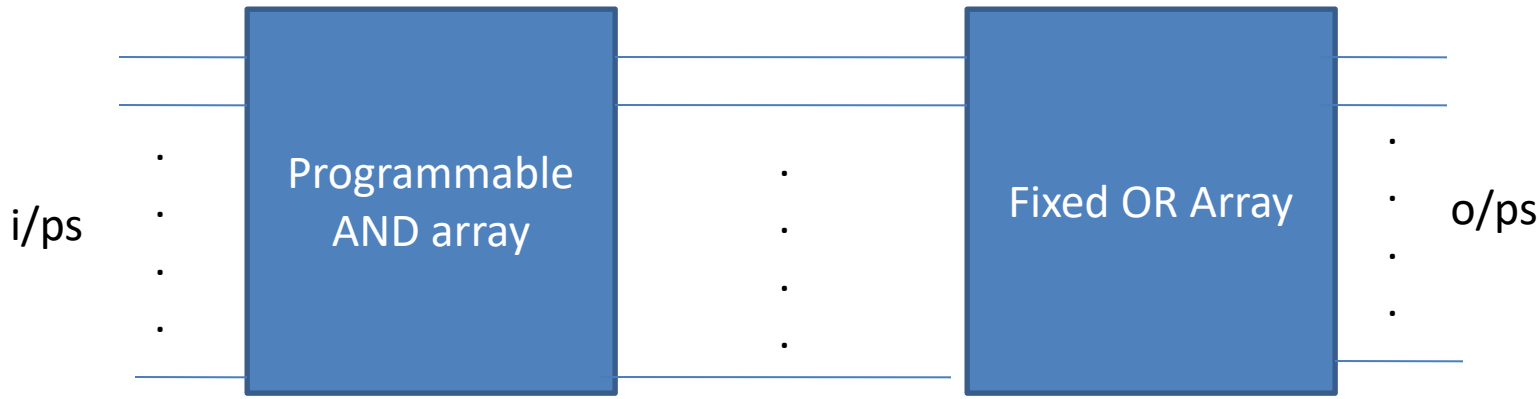



Fig: Block diagram of PAL

# Programmable Logic Array:

- A PLA consists of a programmable AND array and a programmable OR array.
- The PLA is also called a field programmable Logic array (FPLA) because the user in the field programs it, not the manufacturer.
- The use of PLA must be considered for combinational circuits that have a large number of input and outputs. It is superior to a ROM for circuits that have a large

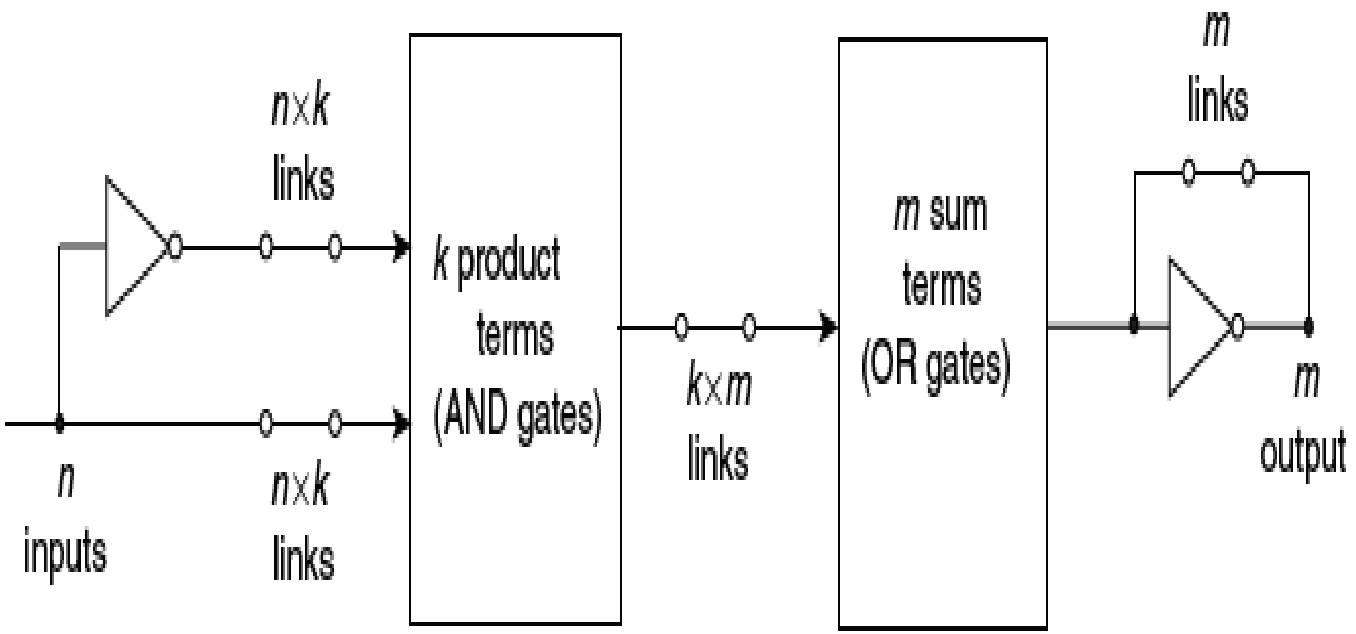



Figure 5-25 PLA block diagram

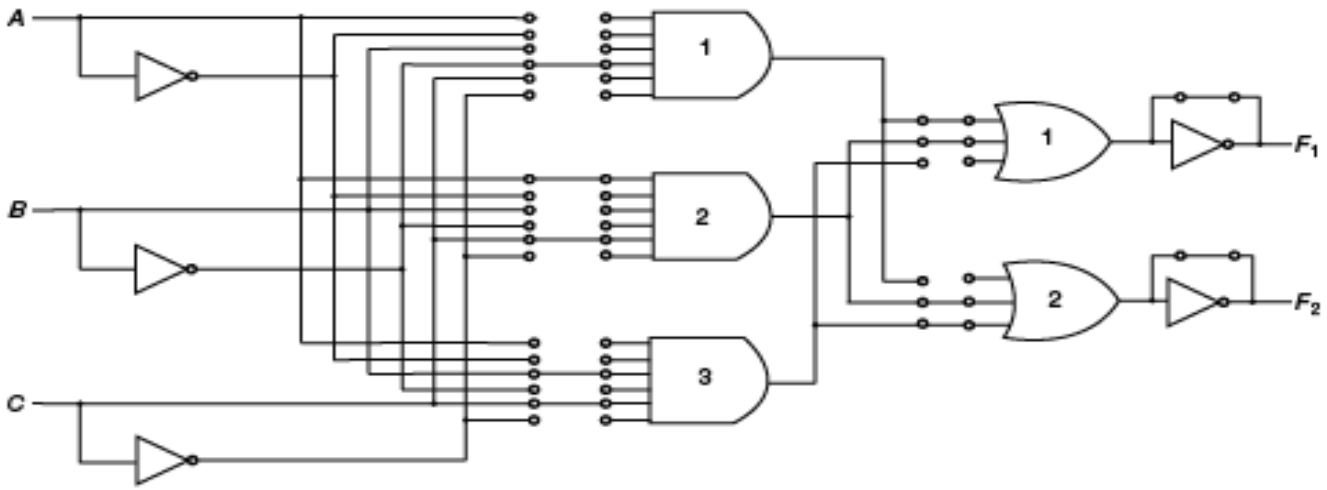
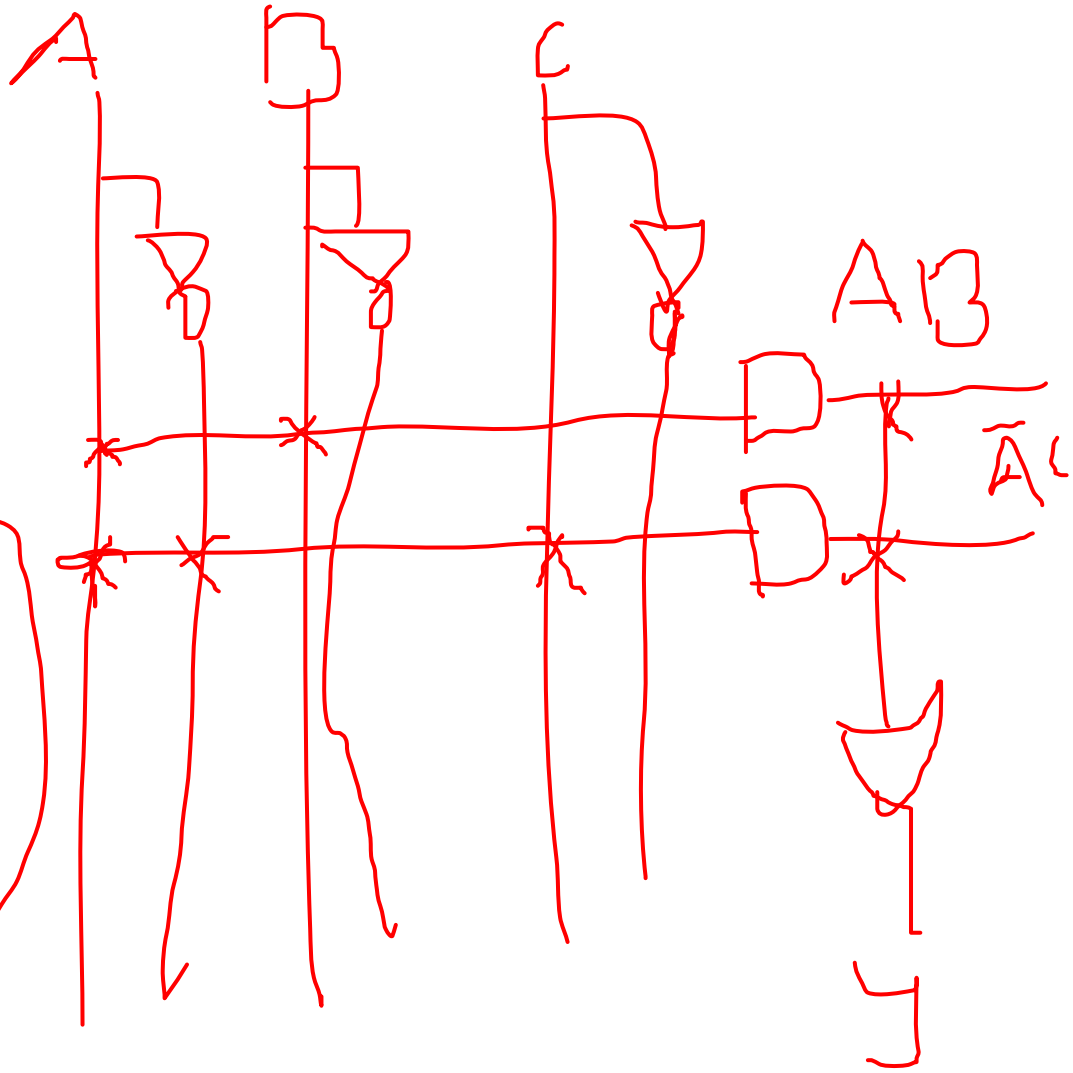



**Figure 5-26** PLA with 3 inputs, 3 product terms, and 2 outputs; it implements the combinational circuit specified in Fig. 5-27

# Implement function using PLA

- F0= sm(0,1,4,6)
- F1= sm(2,3,4,6,7)
- F2= sm(0,1,2,6)

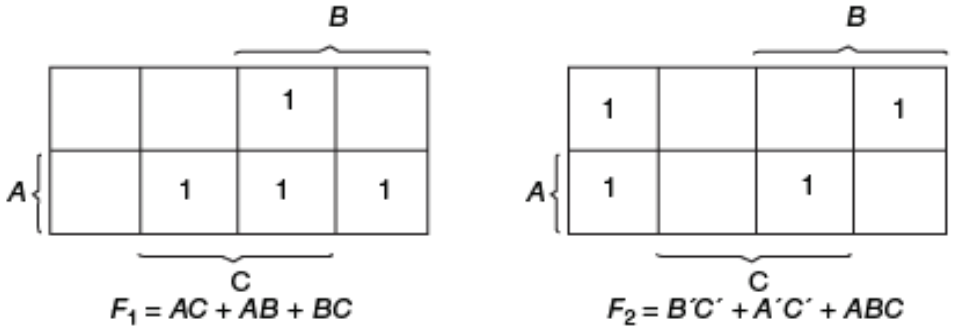
**EXAMPLE 5-6:** A combinational circuit is defined by the functions:

$$F_1(A, B, C) = \sum(3, 5, 6, 7)$$
$$F_2(A, B, C) = \sum(0, 2, 4, 7)$$

Implement the circuit with a PLA having three inputs, four product terms, and two outputs. The two functions are simplified in the maps of Fig. 5-28. Both the true values and the complements of the functions are simplified. The combinations that gives a minimum number of product terms are:

$$F_1 = (B'C + A'C' + A'B')'$$
$$F_2 = B'C + A'C' + ABC$$

This gives only four distinct product terms: $B'C$, $A'C'$, $A'B'$, and $ABC$. The PLA program table for this combination is shown in Fig. 5-28. Note that output $F_1$ is the normal (or true) output even though a $C$ is marked under it. This is because $F'_1$ is generated *prior to* the output inverter. The inverter complements the function to produce $F_1$ in the output.




*PLA* program table

| | Product term | Inputs A | B | C | Outputs $F_1$ | $F_2$ | |
|---|---|---|---|---|---|---|---|
| $B'C'$ | 1 | - | 0 | 0 | 1 | 1 | |
| $A'C'$ | 2 | 0 | - | 0 | 1 | 1 | |
| $A'B'$ | 3 | 0 | 0 | - | 1 | - | |
| $ABC$ | 4 | 1 | 1 | 1 | - | 1 | |
| | | | | | *C* | *T* | *T/C* |

**Figure 5-28** Solution to Example 5-6

# Implement a full adder using PLA:

- Output= sum and carry
- Sum= sm(1,2,4,7)= $A'B'C + A'BC' + ABC + AB'C'$

- Carry=sm(3,5,6,7)= $A'BC + AB'C + ABC' + ABC$