

१६-१७ माघ शनि-रवि १४२१
द्वादशी रात्रि १२/३३/अद्योदशी रात्रि १/११
Saka - 11-12 Magh 1936
अहम - १६-१७ माघ १४२१
Sunrise - 6.21-6.21 A.M.

JANUARY
31
SATURDAY

01st Feb Fataha-Yeaz-Dahum

१२-१३ माघ शुक्ल शनि-रवि २०७७
द्वादशी रात्रि १२/३३/त्रयोदशी रात्रि ११/१५
Hizri-10-11 Rabi-us-sani 1436
३१-१ जनवरी-फरवरी २०१५
Sunset - 5.17-5.18 P.M.

12/1/18

Computer Organisation

CO is concerned with the way, the hardware component is connected to form a computer system.

Two types of architecture :-
i) Von Neumann :- ^{store program concept} Program and data are stored in same memory.

Q 8 Feature :- All modern Computer use the ^{store} program concept which was initially conceived (invent) by the design team of ISA (International Standard Architecture) lead by Von-Neuman. Hence it is known as Von-Neuman Concept. The essential features of this computer are:-

① The Computer has 5 different types of Unit.

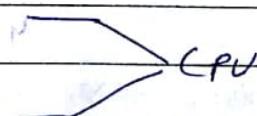
a) memory

b) ALU

c) Control unit

d) Input unit

d) Output unit.



SUNDAY 01

② The program and data are stored in the same memory.

③ Once a program is in memory, the computer can execute it automatically without manual intervention / manual involvement.

④ The control unit fetch and execute the instruction one by one. This sequential

१४ माघ शुक्ल सोमवार २०७९
चतुर्दशी रात २/२८
Hizri - 12 Rabi-us-sani 1436
२ फरवरी २०१५
Sunrise - 6.21 A.M.



୧୮ ମାଘ ମୋହନାର ୧୪୨୧
ଚତୁର୍ଦ୍ଦଶୀ ରାତ ୨/୨୮
Saka - 13 Magh 1936
ଅହମ - ୧୮ ମାଘ ୧୪୨୧
Sunset - 5.19 P.M.

Execution can be modified by certain types of instruction:

- ⑤ An instruction can modify the content of any location in memory, hence a program can modify itself.

Data & instruction cannot be fetched simultaneously because there is one channel present for data transfer.

BCD (Binary Coded Decimal)

5. Convert binary number 1001 into decimal
 (Ans: 9) Method: Divide the given binary number by 10 and record the remainders.
 The remainders will be the decimal digits in reverse order.
Division:
1001 \div 10 = 100 remainder 1
 100 \div 10 = 10 remainder 0
 10 \div 10 = 1 remainder 0
 1 \div 10 = 0 remainder 1
 The remainders are 1, 0, 0, 1 which are the decimal digits in reverse order.
 Hence, the decimal value of 1001 is 9.

To represent 19 we use 8 bit.

Adding 2 BCD $9 \rightarrow 1001$ $5 \rightarrow 0101$

14 $1110 \rightarrow$ if it is not BCD
 \downarrow 0110 as > 1001 here
 $0001\ 0100$ $(0001\ 0100)$ to pass without

FEBRUARY							S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T							
2015							1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	0	0	0

१९ माघ मंगलवार १८२१
 पूर्णिमा शेष रात्रि ८/०८
 Saka - 14 Magh 1936
 अश्वम - १९ माघ १८२१
 Sunrise - 6.20 A.M.



१५ माघ शुक्ल मंगलवार २०७७
 पूर्णिमा शेरा० ४/०८
 Hizri - 13 Rabi-us-sani 1436
 ३ फरवरी २०१५
 Sunset - 5.19 P.M.

$5 \rightarrow 0101$
 $5 \rightarrow 0101$
 1010
 6110
 00010000

To check whether ans. is BCD or not:

① If first two bits if both are high
 then it is greater than 9. Hence we use
 AND gate to check that if both are high

$11xx$

② $1x1x$
 Similarly we use AND gate here.

$1x1x$

00101101
 00101010

∴ The output of ① and ② are passed through
 OR gate to see that if any one of the
 condition is ~~stays~~ meets simultaneously,

১ ফাল্গুন কৃষ্ণ বুধবার ২০৭১
প্রতিপদ শেরাম ৬/০১
Hizri - 14 Rabi-us-sani 1436
৪ ফরবরী ২০১৫
Sunrise - 6.20 A.M.

FEBRUARY
04
WEDNESDAY

২০ মাঘ বুধবার ১৪২১
প্রতিপদ শেং রাঃ ৬/০১
Saka - 15 Magh 1936
অহম - ২০ মাঘ ১৪২১
Sunset - 5.20 P.M.

Adder :-

$$\begin{array}{r}
 0 \ 1 \ 1 \\
 1 \ 0 \ 0 \ 1 \\
 \hline
 1 \ 0 \ 0 \ 0 \ 0
 \end{array}
 \quad \text{Carry:} \quad
 \begin{array}{r}
 1 \ 1 \ 1 \ 1 \\
 + 1 \ 1 \ 1 \ 1 \\
 \hline
 0 \ 0 \ 0 \ 0
 \end{array}
 \quad \text{F/P} \quad \text{S/P} \quad \text{D/P}$$

Book :- Computer Design & Architecture → Morris Mano.

No. representation

① sign magnitude $\rightarrow 1101$

② sign 1's complement $\rightarrow 1010$

③ sign 2's complement $\rightarrow 1011$

One way

$5 \rightarrow 0 \ 101$

$$\begin{array}{r}
 1 \ 0 \ 1 \ 1 \ 0 \ 1 \ 0 \ 0 \\
 0 \ 1 \ 0 \ 0 \ 1 \bullet \ 1 \ 0 \ 0
 \end{array}$$

Number representation

ii) Fixed point number representation

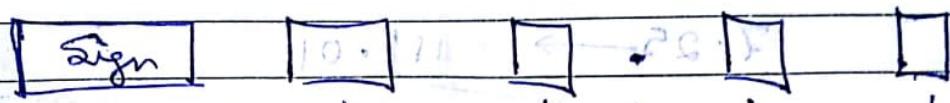
radix point

२१ माघ वृहस्पतिवार १८२१
 शिंदीया अहोरात्र
 Saka - 16 Magh 1936
 अहम - २१ माघ १८२१
 Sunrise - 6.19 A.M.

FEBRUARY
05
 THURSDAY

२ कालगुन कृष्ण गुरुवार २०७९
 द्वितीया (अहोरात्र)
 Hizri - 15 Rabi-us-sani 1436
 ५ फरवरी २०१५
 Sunset - 5.21 P.M.

We assume a point in decimal is present either before the ~~left~~ register or after the register. This is called fixed point register as the point is fixed (we assumed it).



It gives $2 \times 11.11 = 11.11$ assuming the point is fixed here.

② Floating point number representation

$N = m \times r^e$ exponent.

$$N = m \times r^e$$

It works on base

Mantissa

1101010100111011

Eg.: २३४५६७ $\rightarrow 234567 \times 10^{-3}$

$S + E + m \rightarrow 1101010100111011$ or $\rightarrow (-3)$.

or 2.34567×10^{-3}

All the processor making company follows standard They are:

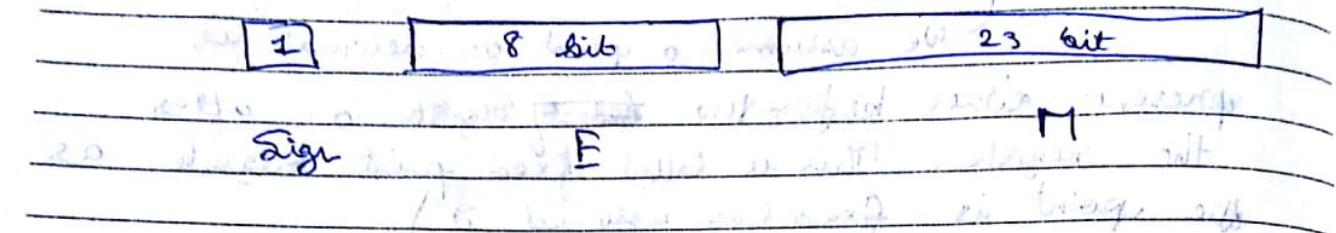
IEEE 754

२ फाल्गुन कृष्ण शुक्रवार २०७१
द्वितीया घो ८/०८
Hizri - 16 Rabi-us-sani 1436
६ फरवरी २०१५
Sunrise - 6.19 A.M.

FEBRUARY
06
FRIDAY

२२ माघ शुक्रवार १४२१
चित्तीया चं ८/०८
Saka - 17 Magh 1938
अहम - २२ माघ १४२१
Sunset - 5.21 P.M.

① Single Precision 32 bits Representation



$$N = (-1)^S \cdot M \times 2^{E+127}$$

Adding so that the exponents are always positive.

$$111.01 = 1.1101 \times 2^2$$

binary hence it is 2 instead of 10

$\therefore 10 \underbrace{100000001}_{M}$

11010000000000000000000

$$\therefore E = 127 + 2$$

$$= 129$$

$$= (100000001)_2$$

M

FEBRUARY		S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	F	S	S	M
2015		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

IEEE 754 Standard

Q) Find the no. $\frac{0}{-} \underline{1000001100101000\dots}$

$$N = (-1)^S \cdot (1.M) \times 2^{131}$$

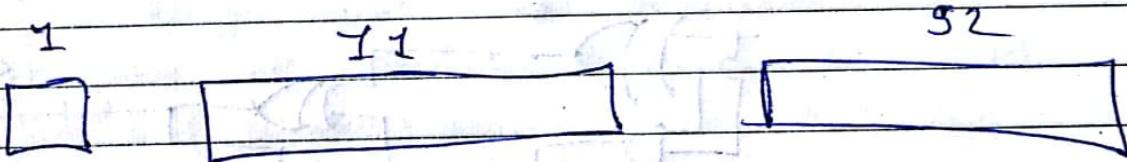
$$= (-1)^5 \cdot (1.M) \times 2^{131-127}$$

$$= (-1)^5 \cdot (1.M) \times 2^4$$

$$= (1.M) \times 2^4 \quad [\because S = 0]$$

$$= (1.00101) \times 2^4$$

$$= (100101)_2$$

64 bit.

17/7/18 SUNDAY 01

Binary Adder

H.A \rightarrow Half adder is a combinational circuit that adds two bits and gives one bit output and one bit carry

A	B	c 1's
0	0	0 0
0	1	0 1

५ फाल्गुन कृष्ण सोमवार २०७७
पंचमी घण्टा १/५५
Hizri - 19 Rabi-us-sani 1436
९ फरवरी २०१५
Sunrise - 6.17 A.M.

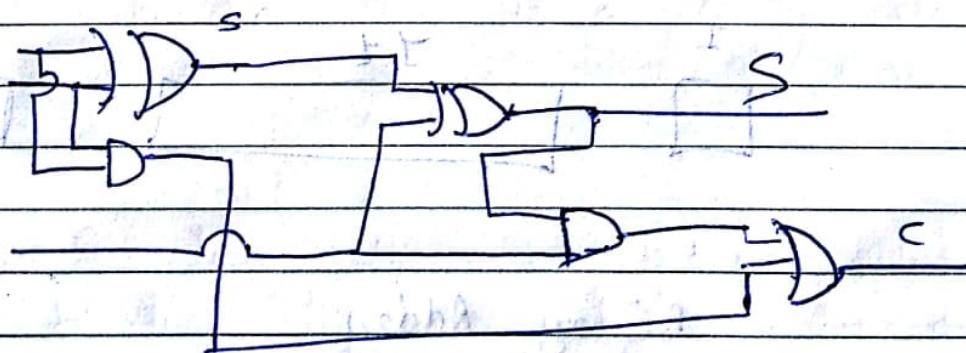
FEBRUARY
09
MONDAY

२५ माघ सोमवार १४२१
पंचमी घण्टा १/५५
Saka - 20 Magh 1936
अहम - २५ माघ १४२१
Sunset - 5.23 P.M.

F.A → Adds three bits and produce one bit sum and one bit carry.

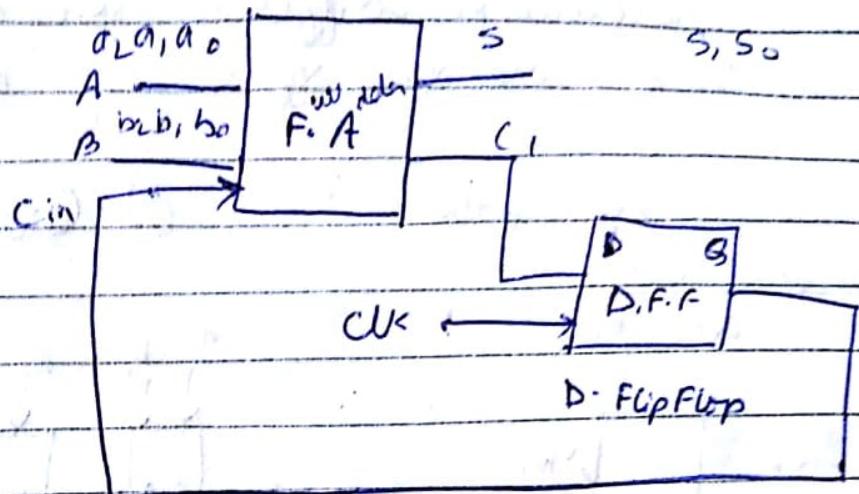
$$\begin{array}{r}
 \text{A} \oplus \text{B} \oplus \text{C} \\
 \hline
 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \\
 0 \oplus 0 \oplus 1 \oplus 1 \oplus 1 \oplus 1 \quad | \\
 0 \quad 1 \quad 0 \quad 0 \quad 1 \quad 1 \\
 0 \oplus 1 \oplus 0 \oplus 1 \oplus 1 \oplus 1 \quad | \\
 0 \quad 0 \quad 0 \quad 1 \quad 1 \quad 1 \\
 0 \oplus 0 \oplus 0 \oplus 1 \oplus 1 \oplus 1 \quad | \\
 0 \quad 0 \quad 1 \quad 1 \quad 0 \quad 1 \\
 0 \oplus 0 \oplus 1 \oplus 1 \oplus 1 \oplus 1 \quad | \\
 0 \quad 1 \quad 1 \quad 1 \quad 1 \quad 1
 \end{array}$$

Circuit diagram



Serial Adder

Parallel " "



Here two bits are added

A serial adder has only a single flip flop, it is used to perform two n bit numbers sequentially, bit by bit starting with least significant bit (lsb) the addition of one bit position takes one clock cycle, thus for an n bit number, n clock cycles are needed to complete the addition process and get result. At each cycle the carry produced by previous bit position should be stored in a flip flop and it is given as a carry input during the next cycle.

Adv: The circuit is small and it is very cheap

Disadv: Serial adder is very slow

② Parallel Adder :- Parallel adder is one which has separate adder circuit for each bit. The parallel adder performs addition of multiple

S	M	T	W	F	S	S	M	T	W	F	S	S	M	T	W	F	S	M	T	MARCH											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	2015

७ फाल्गुन कृष्ण बुधवार २०७९
सप्तमी घो ३/४९
Hizri - 21 Rabi-us-sani 1436
११ फरवरी २०१५
Sunrise - 6.16 A.M.

FEBRUARY
11
WEDNESDAY

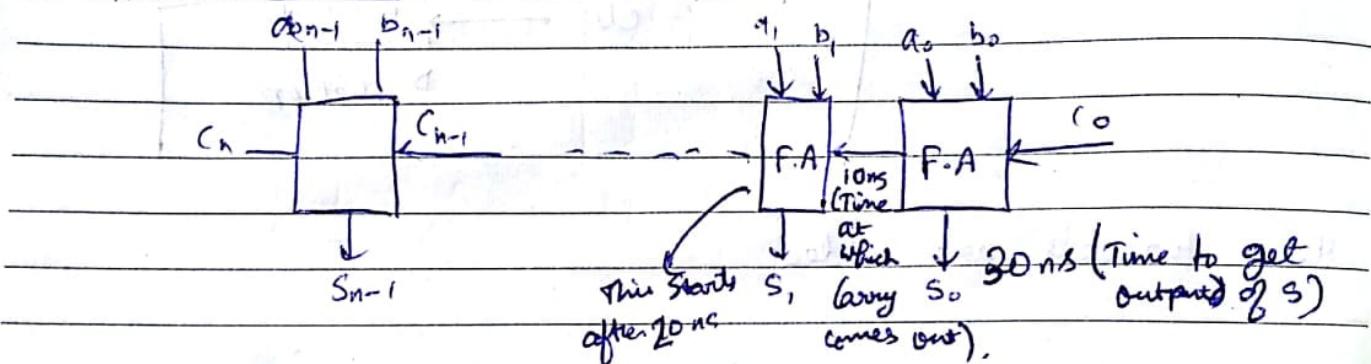
२१ माघ बुधवार १४२१
सप्तमी घं ३/४९
Saka - 22 Magh 1936
अहम - २१ माघ १४२१
Sunset - 5.24 P.M.

stages simultaneously, however the internal addition mechanism differs in different parallel adders. There are two types of adder:-

① Ripple Carry adder:-

② Carry look ahead

① Ripple carry adder :-



The carry output of one adder becomes the carry in of one adder. This type of connection is called cascade mode. This is a combinational circuit (means feedback is not present / output depends only on present input)

Propagation delay :- The time difference between output and Input / The time difference between the given input and the time at which the output is given.

$$\text{Propagation delay} = \delta_t.$$

Hence for a ripple carry the time req = $n \times \delta_t$.

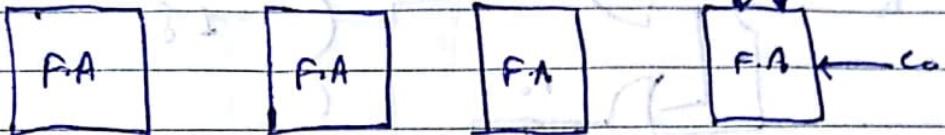
Cascade because previous output is given in present IP.

२८ शाख बुद्धिवार १४२१
अहसी अः ८/१५
Saka - 23 Magh 1936
अहम् - २८ शाख १४२१
Sunrise - 6.16 A.M.

FEBRUARY
12
THURSDAY

८ फाल्गुन कृष्ण गुरुवार २०७९
अहसी अ० ४/१५
Hizri - 22 Rabi-us-sani 1436
१२ फरवरी २०७९
Sunset - 5.25 P.M.

Carry look ahead :- It is even faster than



$$\begin{aligned}
 C_1 &= A_0 B_0 + A_0 C_0 + B_0 C_0 \\
 &= A_0 B_0 + \underbrace{(A_0 + B_0)}_{P_0} C_0 = C_0 + C_0 P_0 \\
 G_0 &\rightarrow \text{generate function} \\
 G_0 &\rightarrow \text{generate function}
 \end{aligned}$$

$$\begin{aligned}
 C_2 &= C_1 + P_1 C_1 \\
 &= C_1 + P_1 (G_0 + P_0 C_0) \\
 &= C_1 + P_1 G_0 + P_1 P_0 C_0
 \end{aligned}$$

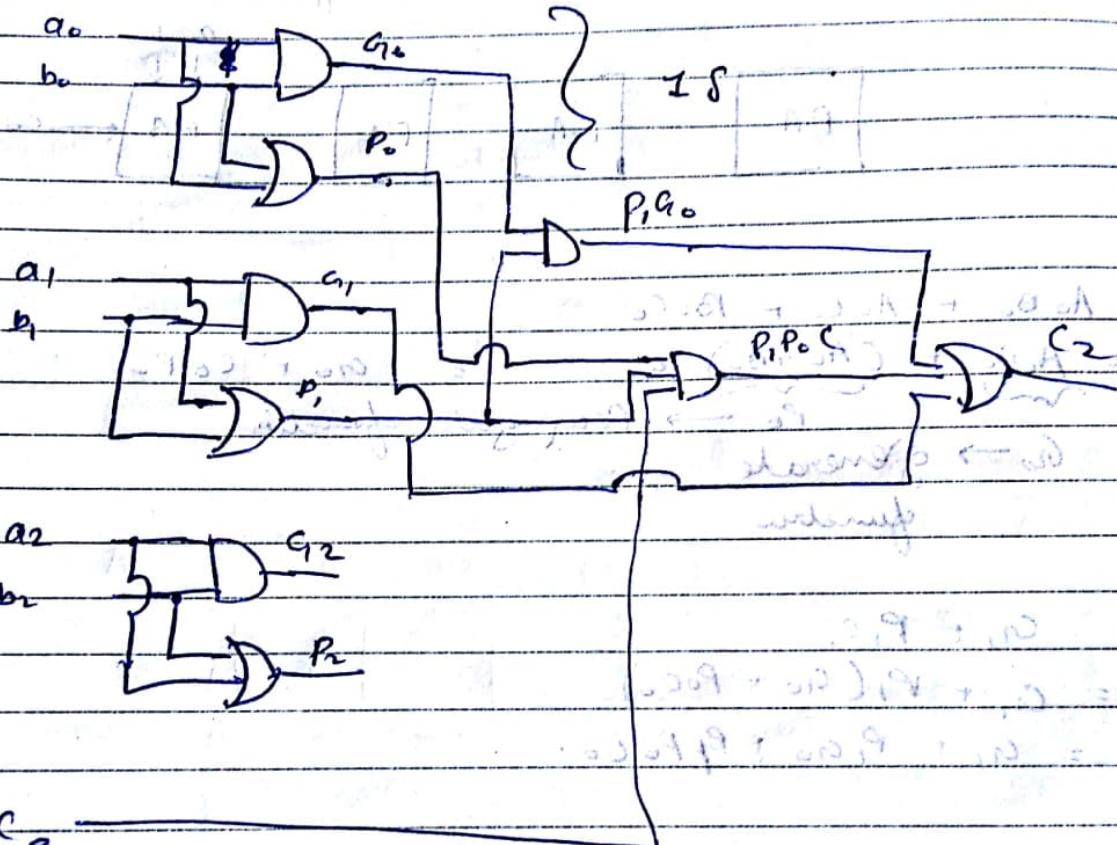
$$\begin{aligned}
 C_3 &= G_2 + P_2 C_2 \\
 &= G_2 + P_2 (C_1 + P_1 C_1) \\
 &= G_2 + C_1 P_2 + P_1 P_2 C_1 \\
 &= G_2 + C_1 P_2 + P_1 P_2 (G_0 + P_0 C_0) \\
 &= G_2 + G_1 P_2 + P_1 P_2 G_0 + P_1 P_2 P_0 C_0
 \end{aligned}$$

$$C_n = G_{n-1} + G_{n-2} P_{n-1} + P_{n-2} P_{n-1} G_{n-3} + \dots +$$

९ फाल्गुन कृष्ण शुक्रवार २०७७
नवमी अ० ४/००
Hizri - 23 Rabi-us-sani 1436
१३ फरवरी २०१५
Sunrise - 6.15 A.M.

FEBRUARY
13
FRIDAY

२९ माघ शुक्रवार १४२३
नवमी अ० ८/००
Saka - 24 Magh 1936
अहम - २९ माघ १४२३
Sunset - 5.26 P.M.



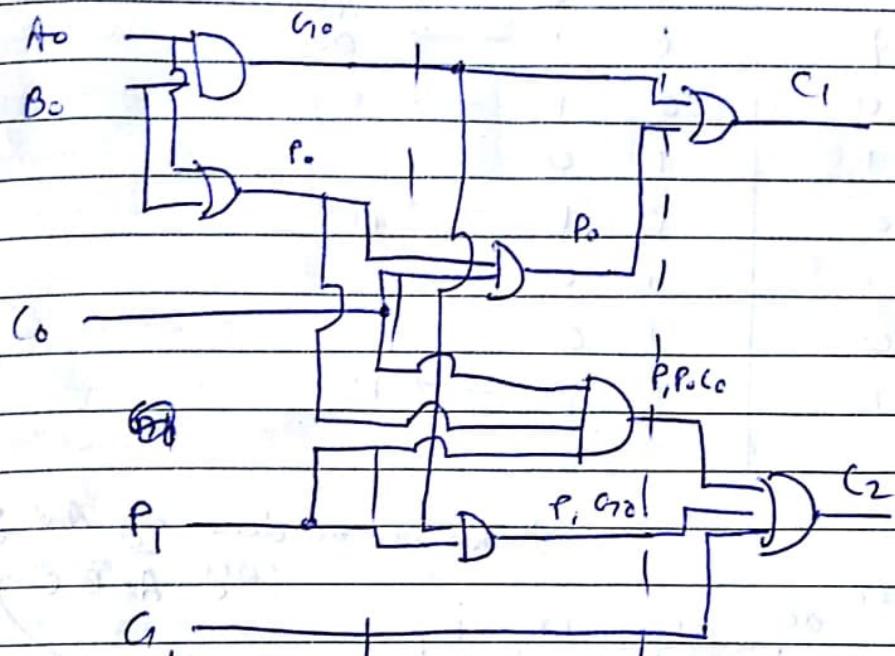
$$G_2 = G_{11} + P_1 G_0 + P_2 G_0$$

१-२ फाल्गुन शनि-रवि १४२१
 दशमी घ० ३/१६/एकादशी घ० २/०५
 Saka - 25-26 Magh 1936
 अह्म - १-२ फाल्गुन १४२१
 Sunrise - 6.14-6.14 A.M.

FEBRUARY
14
 SATURDAY

१०-११ फाल्गुन कृष्ण शनि-रवि २०७९
 दशमी घ० ३/१६/एकादशी घ० २/०५
 Hizri - 24-25 Rabi-us-sani 1436
 १४-१५ फरवरी २०१५
 Sunset - 5.26-5.27 P.M.

8 28 ; 38 time 19 17 18



we can generate all numbers in
 38 time

SUNDAY 15

Sum formula for $\sum(S)$ $\bar{A}\bar{B}C + \bar{A}\bar{B}\bar{C} + A\bar{B}\bar{C} + ABC$

We can prove by Karnaugh map.

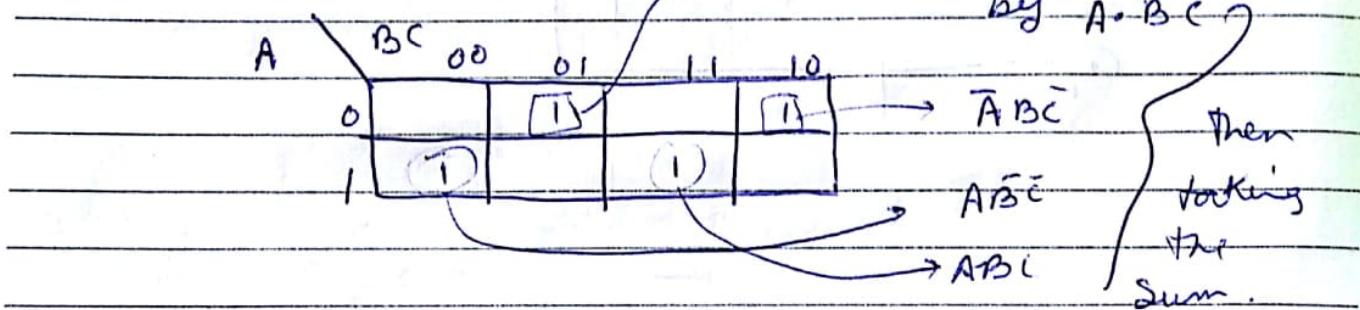
१२ फाल्गुन कृष्ण सोमवार २०७९
द्वादशी घो १२/३२
Hizri - 26 Rabī-us-sani 1436
१६ फरवरी २०१४
Sunrise - 6.13 A.M.

FEBRUARY
16
MONDAY

३ फाल्गुन शोभनात १४२५
धामगी घट १२/३२
Saka - 27 Magh 1936
अहम - ३ फाल्गुन १४२५
Sunset - 5.27 P.M.

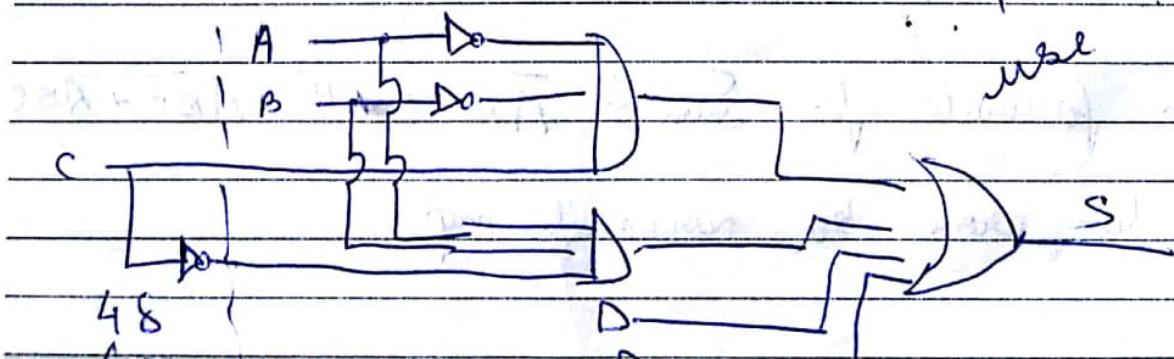
A	B	C	C ₀	S
0	0	0	0	0
0	0	1	0	$\rightarrow ABC$
0	1	0	0	$\rightarrow 001$
0	1	1	0	$\rightarrow 010$
1	0	0	0	$\rightarrow 100$
1	0	1	0	
1	1	0	0	
1	1	1	1	$\rightarrow 111$

This can be done by And gate
by $A \cdot \bar{B} \cdot C$



This shows we get the formula of S. we

for sum step



FEBRUARY	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T
2015	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

After generation of C we have to make C chance +18 t

ବ୍ୟାଜ ମନ୍ଦିର ୧୯୨୧
ପାତ୍ରି ହେ ୧୦/୯୮
ଶାକ - ୨୫ Magh ୧୯୩୬
ଶତ - ୫ ଫାତେ ୧୯୨୧
ସନ୍ଦେ - ୬.୧୨ A.M.



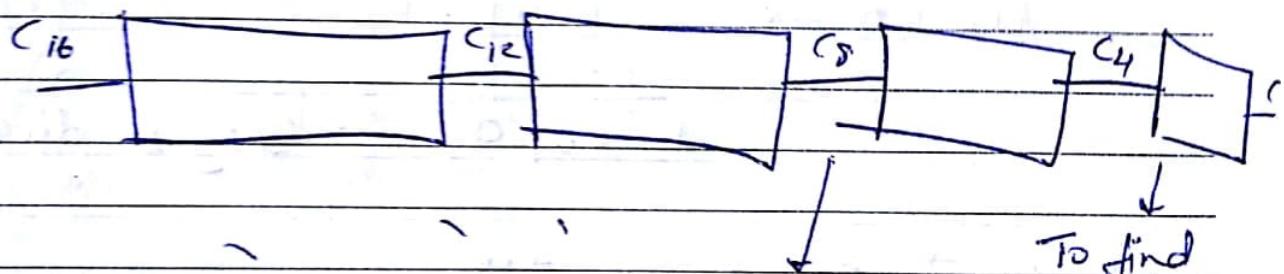
ବ୍ୟାଜ ମନ୍ଦିର ୨୦୨୨
ପାତ୍ରି ହେ ୧୦/୯୮
ଶାକ - ୨୭ Feb ୨୦୨୨ ୧୫୩୬
ଶତ - ୫ ଫାତେ ୧୯୨୧
ସନ୍ଦେ ୫.୨୦ P.M.

Problem :- To find c_1 we use 2 input gate
 $" "$ c_2 " " " c_3 " " " c_n

" " c_n " $(n+1)$ input gates

This is not possible as max we get 8 input gate.

Hence to add 16 bit we use 8 input IC $74X1$



To find
 we have to c_4 we take
 wait for. 28 [leaving
 c_4 then the time
 28 time is for generation
 reg for c_4 of G_0, F_0
 $(38-8)$]

∴ Total time : - $1 + 2 + 2 + 2 + 2 + 3 = 15 \times 5 \text{ ns}$
 $\uparrow \uparrow \uparrow \uparrow \uparrow \uparrow$ for sum
 Generating 18 $c_2 c_4 c_6$ for sum
 of $G_0 F_0$ better for 10^10 ns

१४ फाल्गुन कृष्ण तुधवार २०७९
घुर्दशी घो ८/३४
Hizri - 28 Rabi-us-sani 1436
१८ फरवरी २०१५
Sunrise - 6.12 A.M.

FEBRUARY
18
WEDNESDAY

२ फाल्गुन नवमी त्रिंशी १४२३
चतुर्दशी शक ८/६४
Saka - 29 Magh 1436
अद्यम - २ फाल्गुन १४२३
Sunset - 5.28 PM

६ फाल्गुन वृश्चिक १४२३
अमावस्या शक ८/६५
Saka - 30 Magh 1436
अद्यम - ६ फाल्गुन १४२३
Sunrise - 6.1

Look ahead = ३०.१५
Look ahead + Ripple (new) = ६०.१५.

To find the subtraction (Using 2's complement).

$$\begin{array}{r}
 13 \rightarrow 01101 \\
 -11 \rightarrow 11011
 \end{array}
 \begin{array}{l}
 \xrightarrow{\text{Sign magnitude}} \\
 \xrightarrow{\text{Sign 1 compliment}}
 \end{array}
 \begin{array}{r}
 01101 \\
 10100
 \end{array}
 \begin{array}{l}
 \xrightarrow{\text{Sign 2's compliment}} \\
 \xrightarrow{\text{Add both}}
 \end{array}
 10101$$

$$\begin{array}{r}
 \text{Add both} \rightarrow 01101 \\
 10101 \\
 \hline
 100010
 \end{array}
 \rightarrow \text{Carry is discarded.}$$

Carry \rightarrow ans is +ve.
no carry \rightarrow ans is -ve.

For no carry :-

$$\begin{array}{r}
 11 - 01011 \\
 -13
 \end{array}$$

$$\begin{array}{r}
 01011 \\
 10111 \\
 \hline
 11110
 \end{array}
 \rightarrow \text{no carry.}$$

Ans $= -(2^5 \text{ comp})$

$$= -(00010)$$

FEBRUARY	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T
2015	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

৬ ফাতেম বৃহস্পতিবার ১৮২১
 অমাৰস্যা প্ৰা: ৬/১৭/প্ৰতিপদ রাঃ ৩/৫৬
 Saka - 30 Magh 1936
 অহো - ৬ ফাতেম ১৮২১
 Sunrise - 6.11 A.M.

FEBRUARY
19
 THURSDAY

১৫/১ ফাল্গুন কৃষ্ণ-শুকল গুৰুবাৰ ২০৭৭
 অমাৰশ্যা প্ৰা: ৬/১৭/প্ৰতিপদ রাঃ ৩/৫৬
 Hizri - 29 Rabi-us-sani 1436
 ১৯ ফৱৰী ২০১৫
 Sunset - 5.29 P.M.

Sign's 2's Complement \rightarrow MSB Remains Same i.e '1'.

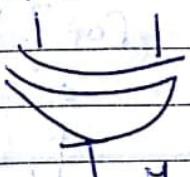
$$-11 = 11011$$

$$\xrightarrow{2's \text{ comp}} \boxed{1} 0101$$

↓
remains same,

How to make NOT from XOR

$$A=0 \quad B$$



$$\begin{aligned} Y &= A\bar{B} + \bar{A}B \\ &= 0\bar{B} + 1.B \\ &= B \end{aligned}$$

Putting $A=0 \rightarrow$ buffer
 i.e no change

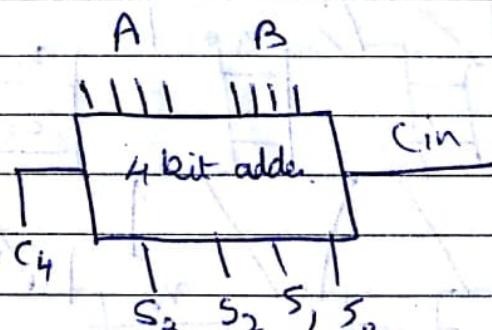
$A=1 \rightarrow$ inverter
 i.e NOT gate

How to Subtract.

$$A+B = Add$$

$$A+(B+1) = Sub$$

↓
2's Comp



Using XOR we have to do it.

२ फाल्गुन शुक्ल शुक्रवार २०७१

द्वितीया रात १/३३

Hizri - 30 Rabi-us-sani 1436

२० फरवरी २०१५

Sunrise - 6.11 A.M.

FEBRUARY

20

FRIDAY

Janmatithi of Ramkrishana Deb

१ फाल्गुन शुक्रवार १४२१

द्वितीया रात १/३३

Saka - 1 Falgoon 1836

अश्व - १ फाल्गुन १४२१

Sunset - 5.29 P.M.

20/7/15

Multiplication of unsigned binary numbers

1101 → Multiplier Multiplied (m^1)

~~x 1111~~ → Multiplicand Multiplie (n^1)

1101 → Partial product

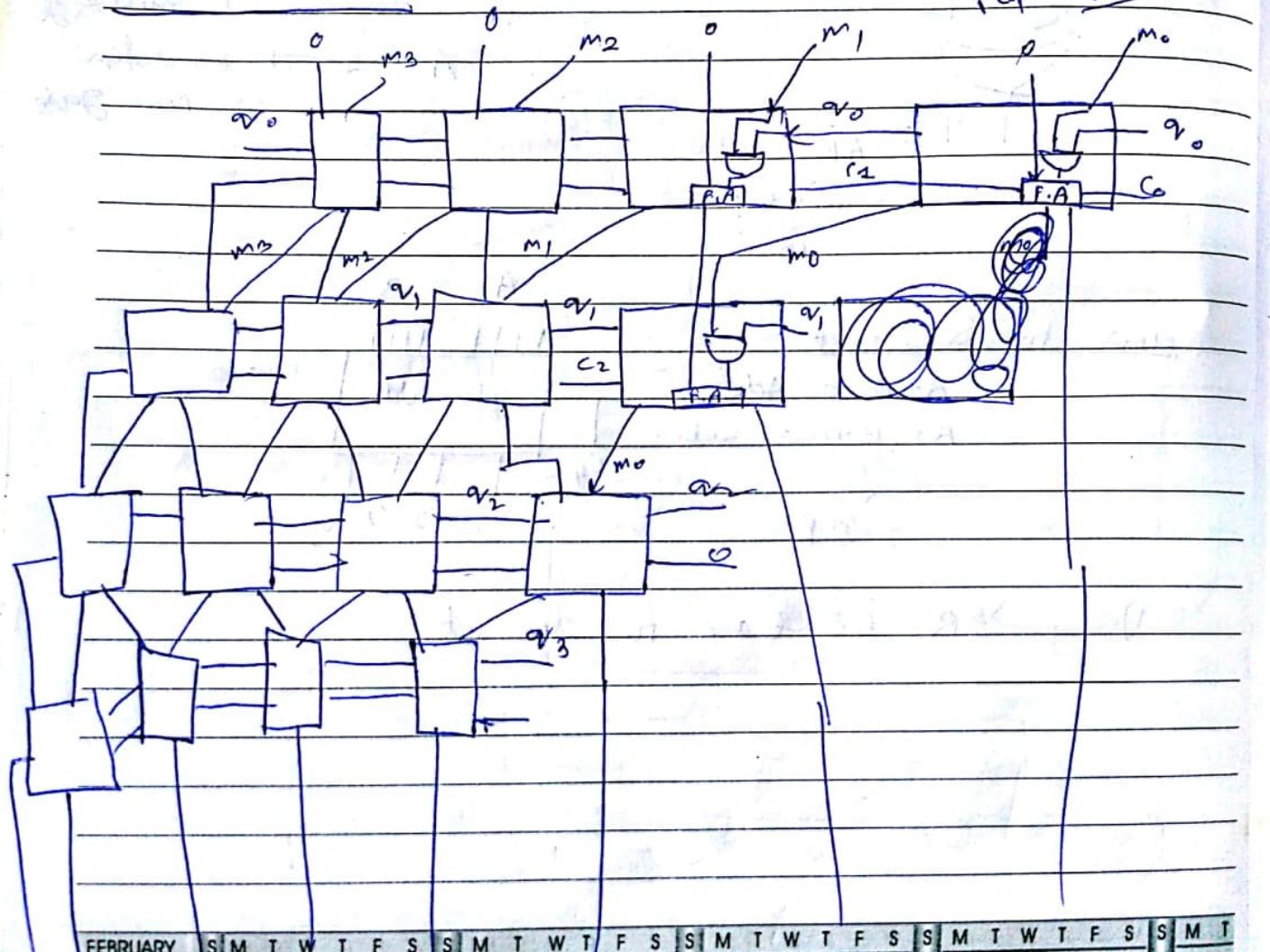
1011x

1011xx

1011xx

Aray's interpretation
of multiplication /
manual method

Paper pen method



FEBRUARY	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T
2015	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

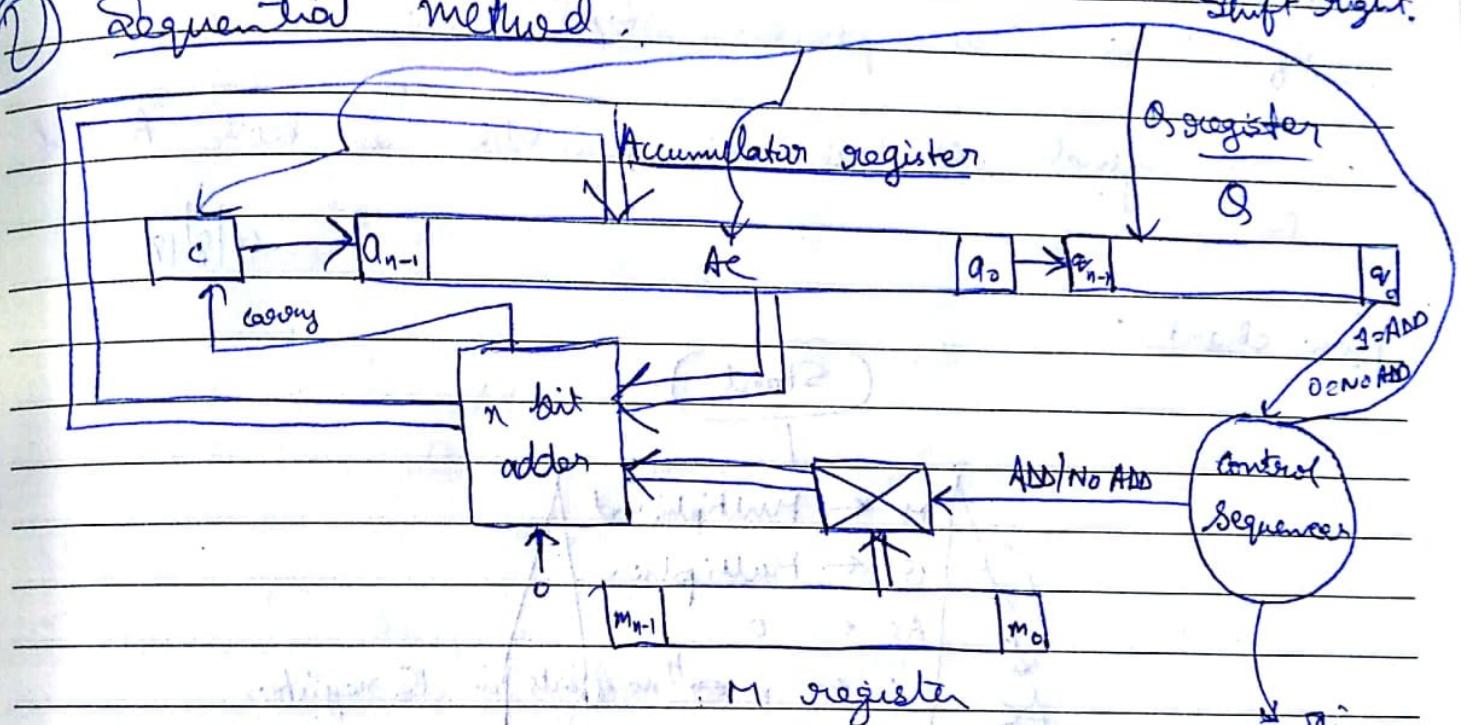
४२९ फालुन शनि-रवि १४२१
 तृतीया रातः ११/१५/चतुर्थी रातः ९/०९
 Saka - 2-3 Falgoon 1936
 अश्व - ८-९ फालुन १४२१
 Sunrise - 6.10-6.09 A.M.

FEBRUARY
21
 SATURDAY

३-४ फालुन शुक्र शनि-रवि २०७७
 तृतीया रात ११/१५/चतुर्थी रात ९/०९
 Hizri - 1-2 Zamadilawal 1436
 २१-२२ फरवरी २०७५
 Sunset - 5.30-5.30 P.M.

The circuit :- for multiplication of n bits by m bits it requires $2n$ Adder. Hence not cost effective. Thus, a section is designed for this circuit which take lot of space hence it is not used.

① Sequential method.



- ① Multiplicand is loaded to M
- ② Multiplier is loaded to Q
- ③ Initial step: Multiplicand is loaded to M
- ④ Ac and C is set to 0

SUNDAY 22

Sequence

- ⑤ After initialization, the lower order bit or lsb of the multiplier is tested / checked. If it is 1 the multiplicand M is added to the present partial product in Ac

५ फाल्गुन शुक्ल सोमवार २०७९
पंचमी रात ७/१२
Hizri - 3 Zamadilawal 1436
२३ फरवरी २०१५
Sunrise - 6.08 A.M.

FEBRUARY
23
MONDAY

१० फाल्गुन सोमवार १८२३
पंचमी रात ७/१२
Saka - 4 Falgoon 1836
अहम - १० फाल्गुन १८२३
Sunset - 5.31 P.M.

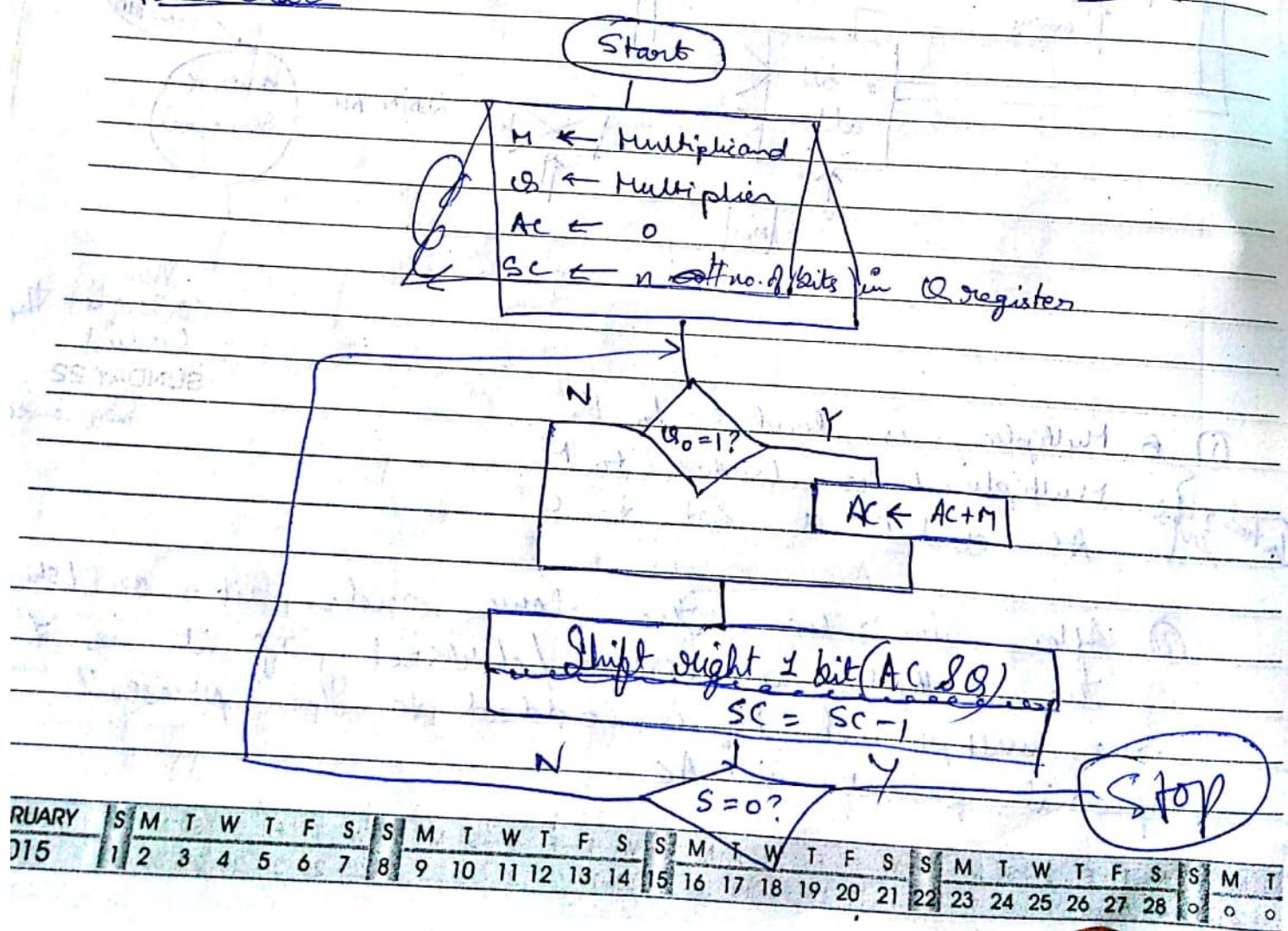
If it is zero nothing is done. Register Q (A) is shifted one bit to the right to form the new partial product. (Sequence controller is loaded with n).

The sequence counter is decreased by 1. If it is not equal to zero the process is repeated and if it is zero, process stops.

The final product is available in both AC & Q.

Flow chart :-

9/8/18



RUARY	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T
	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
																22	23
																24	25
																26	27
																28	0
																0	0

११ फाल्गुन मंगलवार १८२१
षष्ठी सं ५/३५
Saka - 5 Falgoon 1936
अहम - ११ फाल्गुन १८२१
Sunrise - 6.07 A.M.

FEBRUARY
24
TUESDAY

६ फाल्गुन शुक्ल मंगलवार २०७९
षष्ठी सं ५/३५
Hizri - 4 Zamadilawal 1436
२४ फरवरी २०१५
Sunset - 5.31 P.M.

Most significant half \rightarrow AC
Least significant half \rightarrow B

Two n-bit no. A and B gets multiplied to form 2n bit.
first 'n' bit remains in AC and last 'n' bit remains in B.

Eg +

$$A \rightarrow 111 \quad B \rightarrow 101$$

AC	B	SC
0 0 0	1 0 1	0 0 0 0

~~Step 7.~~

AC	B	SC
1 1 1	1 0 1	0 0 0 0

~~Shift right 0 1 1~~
~~Shift right 0 0 1~~

Adding M [c]

$$1 \quad 0 \quad 0 \quad 0 \quad , \quad 1 \quad 1 \quad 1$$

Shift right 0 1 0 0 | 0 1 1 0

Ans \rightarrow 100 011 \rightarrow 35

S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	MARCH														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	2015

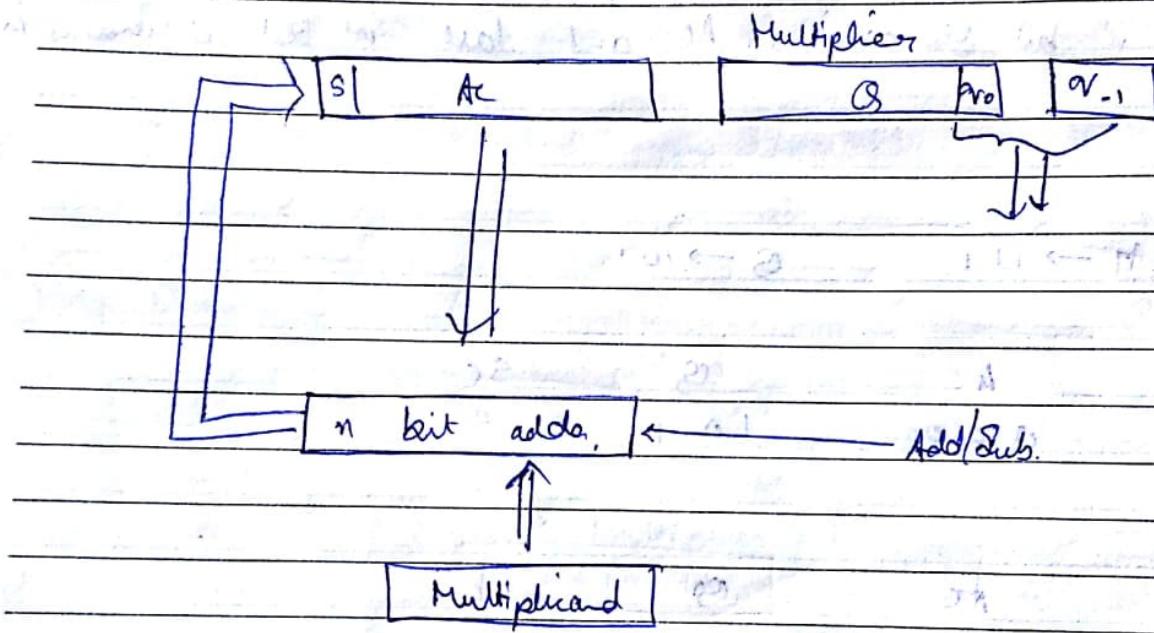
७ फाल्गुन शुक्ल बुधवार २०७९
 सप्तमी अ० ४/२२
 Hizri - 5 Zamadilawal 1436
 २५ फरवरी २०१५
 Sunrise - 6.06 A.M.

FEBRUARY
25
 WEDNESDAY

१२ फाल्गुन वृद्धवात्र १
 सप्तमी अ० ४/२२
 Saka - 6 Falgoon 1
 अश्व - १२ फाल्गुन १८
 Sunset - 5.32

Multiplication of Signed No

Booth's Algorithm



$$\text{Eg: } M \leftarrow (+) = 0111 \rightarrow 2^{\text{'s Comp}} = 1001$$

$$Q = (-5) = 1,01 \rightarrow 2^{\text{'s Comp}} = 1011$$

Q stores Sign flag's
 complement of
 multiplier

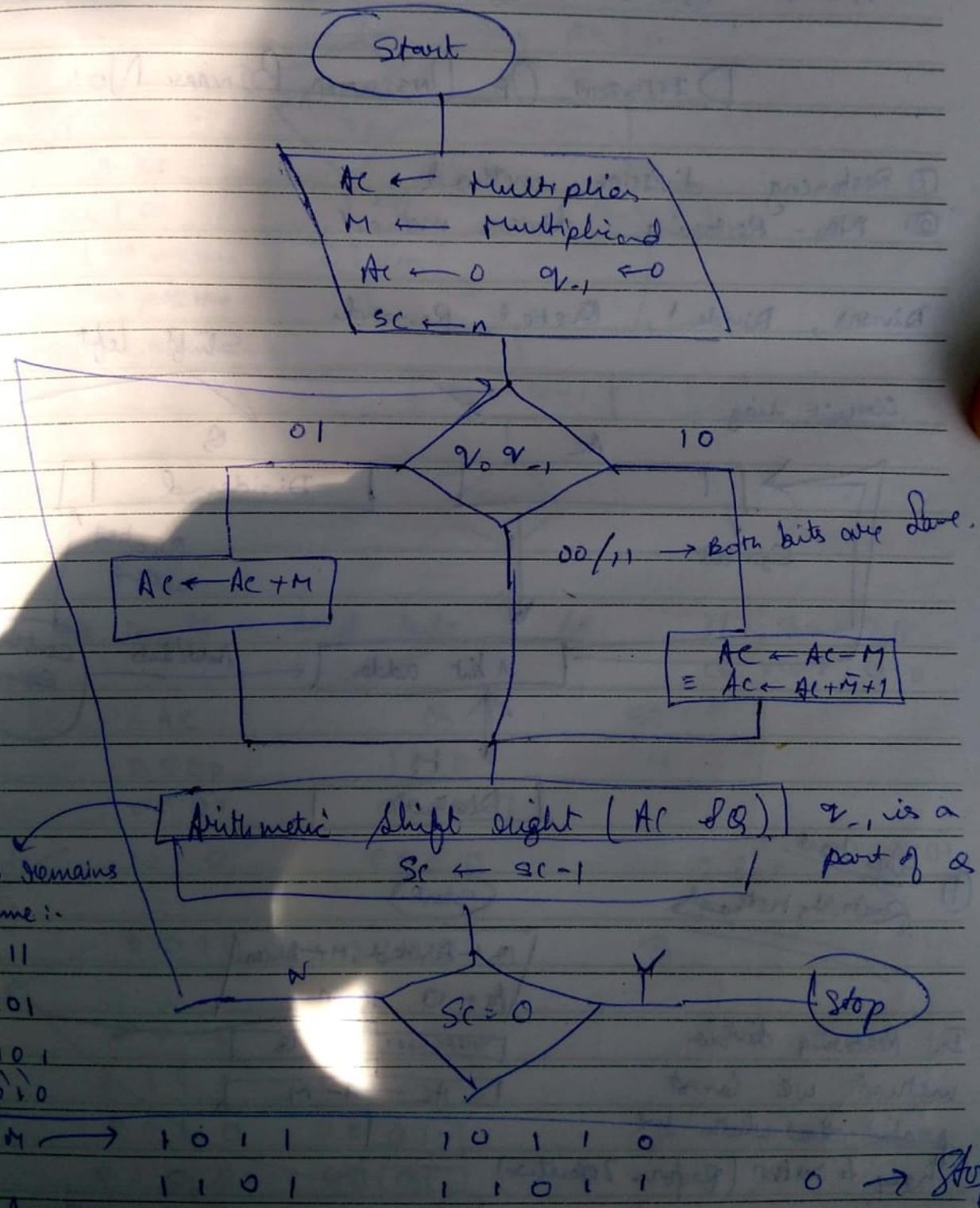
Ac	Q	Q-1	Sc
0 0 0 0	1 0 1 1	0	4 0 0 0
1 0 0 1	1 0 1 1		
1 1 0 0	1 1 0 1	1	3 0 0 0
1 1 1 0	0 1 1 0	1	2
0 1 0 1	0 1 1 0		
1 0 1 0			

Step f
 adding n
 2's comp
 arithmetic shift
 ignore carry
 sign reading M (ignore carry)

१३ फाल्गुन बहुप्रतिवार १४२१
अष्टमी घं ३/३८
Saka - 7 Falgoon 1936
अहम - १३ फाल्गुन १४२१
Sunrise - 6.06 A.M.

FEBRUARY
26
THURSDAY

८ फाल्गुन शुक्ल गुरुवार २०७९
अष्टमी घं ४/३८
Hizri - 6 Zamadilawal 1436
२६ फरवरी २०१५
Sunset - 5.33 P.M.



S	M	T	W	T	F	S	S	M	T	W	F	S	S	M	T	MARCH															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	2015

FEBRUARY

27

FRIDAY

९ फाल्गुन शुक्रवार २०७७
नवमी घो ३/१५
Hizri - ७ Zamadilawal 1436
२७ फरवरी २०१५
Sunrise - 6.05 A.M.

१४ फाल्गुन शुक्रवार १४२१
नवमी घो ७/१५
Saka - ८ Falgoon 1936
अहम - १४ फाल्गुन १४२१
Sunset - ५.३३ P.M.

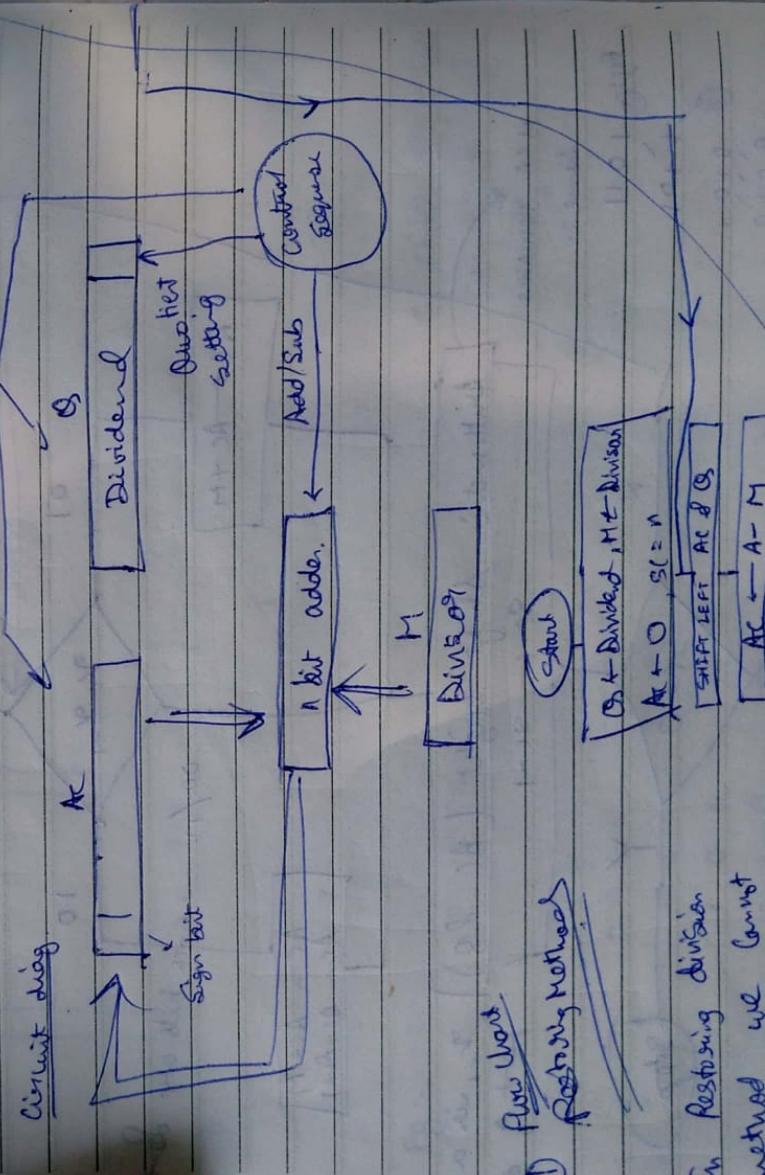
$$M = -7 \quad Q = 5 \quad \text{and} \quad M = -7 \quad Q = -5$$

Difference Of Unsigned Binary Nos

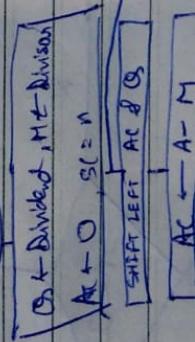
- ① Restoring division method
- ② Non-Restoring division method.

Divisor, Dividend, Quotient, Remainder

Shift left



Flow chart
① Restoring method



f In Restoring division method we cannot

१५-१६ फाल्गुन शनि-रवि १४२१
दशमी घो ३/२७/एकादशी अंग ८/१०
Saka - 9-10 Falgoon 1936
अहम - १५-१६ फाल्गुन १४२१
Sunrise - 6.04-6.03 A.M.

FEBRUARY
28
SATURDAY

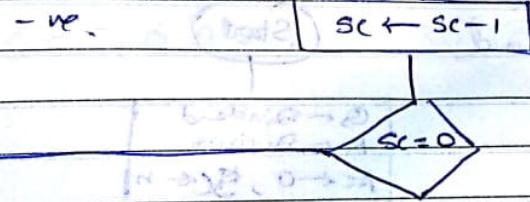
१०-११ फाल्गुन शुक्ल शनि-रवि २०७९
दशमी घो ३/२७/एकादशी अंग ४/१०
Hizri - 8-9 Zamadilawal 1436
२८-१ फरवरी-मार्च २०१५
Sunset - ५.३४-५.३४ P.M.

Checking
whether
nth bit
of AC is 1 or
0.

If 1 → negative
0 → positive

No. in AC in either +ve or
-ve.

-ve.



$$\text{No. of bits in } M = \text{no. of bits in } AC. \quad M = 3 = 0011 \\ Q = 10 = 1010$$

	AC	Q	SC
M = 3	0 0 0 0	1 0 1 0	4
Step I :-	1 0 0 0 1	0 1 0 0	
Step II :-	1 1 1 0	0 1 0 0	
Subtracting M	0 0 0 1	0 1 0 0	→ Q Set to 0

	AC	Q	SC
	0 0 1 0	1 0 0 0	
	1 1 1 1	1 0 0 0	
AC = AC + M	0 0 1 0	1 0 0 0	2
	0 1 0 1 1	0 0 0 1	
AC = AC - M	0 0 1 0	0 0 0 1	1

MARCH															
S	M	T	W	T	F	S	S	M	T	W	F	S	S	M	T
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

१२ फाल्गुन शुक्ल सोमवार २०७९
द्वादशी स० ५/२२
Hizri - 10 Zamadilawal 1436
२ मार्च २०१४
Sunrise - 6.02 A.M.

MARCH
02
MONDAY

१७ फाल्गुन सोमवार १४२१
द्वादशी स० ५/२२
Saka - 11 Falgoon 1936
अहम - १७ फाल्गुन १४२१
M.A. Sunset - 5.35 P.M.

Shift Left

0	1	0	0	0	0	1	0
0	0	0	1	0	0	1	1
0	0	0	1	0	1	1	0

Discard Carry

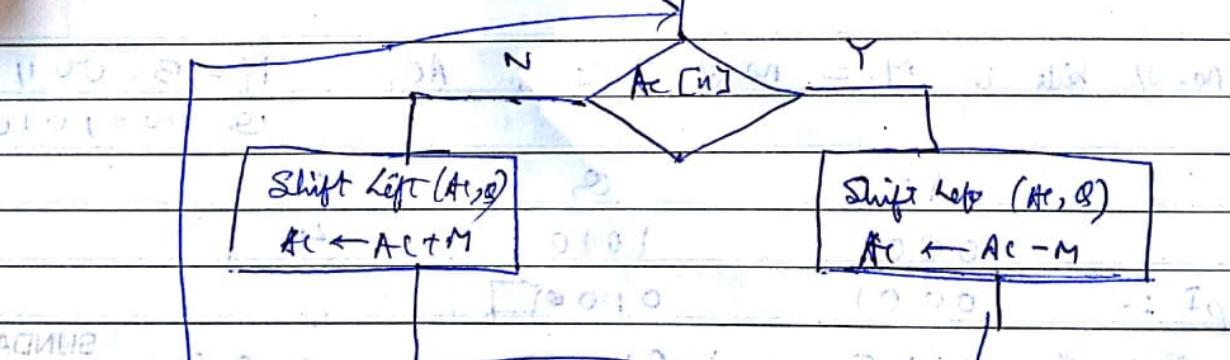
Remainder
is in AC.

Quotient is in Q

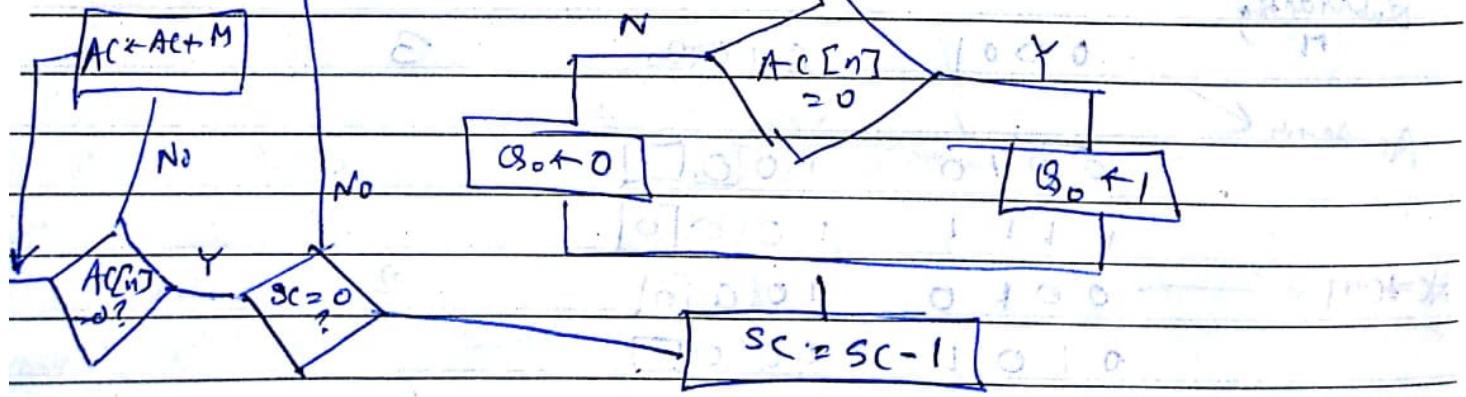
② Non-restoring Method

Start

$Q \leftarrow \text{Dividend}$
 $M \leftarrow \text{Divisor}$
 $AC \leftarrow 0, SC \leftarrow n$



TO YADAV



১৪২১
৫/২২
on 1936
১৪২১
35 P.M.

১৮ ফালুন মঙ্গলবার ১৪২১
হিয়দরাবাদী রাত ৬/৫৯
Saka - 12 Falgoon 1936
জহর - ১৮ ফালুন ১৪২১
Sunrise - 6.01 A.M.

MARCH
03
TUESDAY

১৩ ফালুন শুক্ল মঙ্গলবার ২০১৭
ত্রিয়াবদী রাত ৬/৫৯
Hizri - 11 Zamadilawal 1436
৩ মার্চ ২০১৪
Sunset - 5.35 P.M.

M	AC	S	C
0011	0000	0100	SC
Step ① :- 2 ⁴	0001	0100	4
1101	1110	0100	3
AC = AC - M	1100	1000	
AC = AC + M	1111	1000	2
Shift	1111	0000	
Shift Left.	0100	0000	
AC = AC - M	0001	0011	0

Ans :-

12/8/18

Divided loaded into

AC and S Register.

① The divided must be expressed as an 8-bit 2's complement number.

② Shift AC, S left one bit.

③ If m and AC have the same sign
(divisor)

AC \leftarrow AC + m; otherwise perform AC \leftarrow AC - m

④ The preceding operation is successful if the sign bit of AC is same before and after operation.

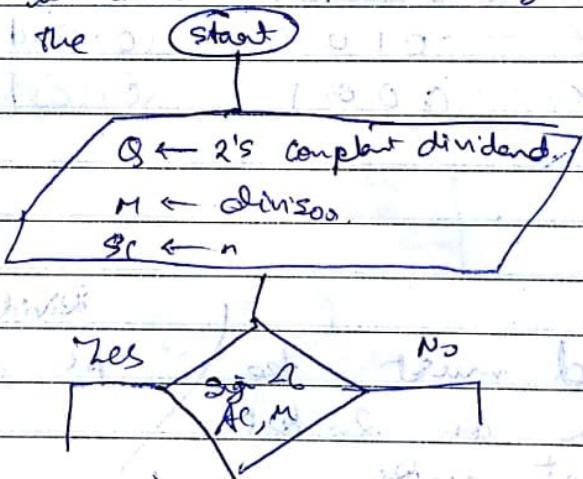
APRIL																
W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F
12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
29	30	31														

१४ फाल्गुन शुक्ल बुधवार २०७९
चतुर्दशी रात ८/४४
Hizri - 12 Zamadilawal 1436
४ मार्च २०१५
Sunrise - 6.00 A.M.

MARCH
04
WEDNESDAY

१९ फाल्गुन बृद्धवार १४२१
चतुर्दशी रात ८/४४
Saka - 13 Falgoon 1936
अहम - १९ फाल्गुन १४२१
Sunset - 5.36 P.M.

- (a) If the operation is successful or the value of Ac is 0, then Q. is set to 1.
- (b) If the operation is unsuccessful and Ac \neq 0, then the Q. is set to 0 and restore the previous value of Ac.
- (c) Repeat step (b) to (d) as many times there are bit position in Q.
- (d) The remainder is in Ac. If the sign of divisor and dividend were the same, the quotient is in Q. otherwise the current quotient is 1 less than the 2's complement of Q.



$-7/3$

$7 \rightarrow 00000111$

2^1 Comp $\rightarrow 1111001$ \rightarrow This is loaded in Ac & Q

Ac Q

at this instant in time 1111001 is 1001

२० फाल्गुन बृहस्पतिवार १८२१
 पूर्णिमा रात्रि ११/०५
 Saka - 14 Falgoon 1936
 अहम - २० फाल्गुन १८२१
 Sunrise - 5.59 A.M.

MARCH
05
 THURSDAY
 Doljatra / Holi

१५ फाल्गुन शुक्ल गुरुवार २०७९
 पूर्णिमा रात्रि ११/०५
 Hizri -13 Zamadilawal 1436
 ५ मार्च २०१५
 Sunset - 5.36 P.M.

INSTRUCTION :-

Instruction is a command.

Instruction format

Two parts → ① OP code → Operation Code
 ② Operand → data

OP Code → The first part of an instruction which specifies the operation to be performed.

Operand → The second part of an instruction is operand.
 It is the data on which operation is performed.

Instruction classification according to size :-

- ① Single byte instruction
- ② Two " "
- ③ Three "

According to address :- address of the operand

- ① Zero address instruction → ~~operand is with instruction~~
 In the instruction the address of the operand is not given. The operand remains in the Accumulator (register) in the processor memory.
- ② One address of operand
- ③ Two addresses of operand
- ④ Three addresses of operand

W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

APRIL

2015

१ चैत्र कृष्ण शुक्रवार २०७९
प्रतिपद रात १/०७
Hizri - 14 Zamadilawal 1436
६ मार्च २०१५
Sunrise - 5.58 A.M.

MARCH
06
FRIDAY
Hindi Holi

২১ ফাল্গুন উক্তবার ১৪২১
প্রতিপদ রাত ১/০৭
Saka - 15 Falgoon 1936
অহুন - ২১ ফাগুন ১৪২১
Sunset - 5.36 P.M.

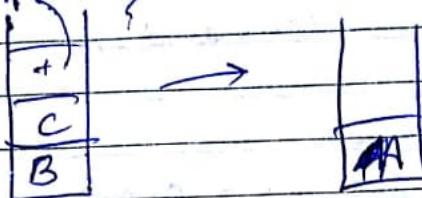
Accumulator stack register.

① New address instruction:

$$A = B + C$$

Instruction push B
in which push C

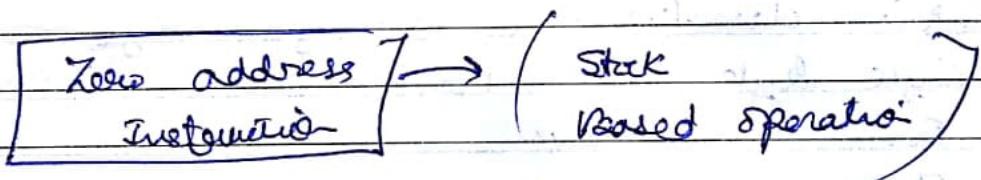
no-address Add BC
is specified. Pop A



23/8/18

Result :-

② New address instruction do not contain any operand address. The operand addresses are implied.



③ One address instruction, only one operand address, is specified in the instruction the operand address is implied. The other operand is in the accumulator. The result is placed in the accumulator.

LOAD :-

Transmit data from memory to register of CPU.

Store → opposite of Load.

২২-২৩ ফালুন শনি-বৃক্ষ ১৪২১
দ্বিতীয়া রাত ৩/০৩/তৃতীয়া শেষ ৮/৮০
Saka - 16-17 Falgoon 1936
অহম - ২২-২৩ ফালুন ১৪২১
Sunrise - 5.58-5.57 A.M.

MARCH
07
SATURDAY

২-৩ চৈত্র কৃষ্ণ শনি-বৃক্ষ ২০৭৭
দ্বিতীয়া রাত ৩/০৩/তৃতীয়া শেরা ৪/৪০
Hizri - 15-16 Zamadilawal 1436
৭-৮ মার্চ ২০১৫
Sunset - 5.37-5.37 P.M.

Load B → Reg B is an accumulator

OP Code Operand.

Add C.

→ Acc ← C + B.

← CPU's register.

Store C → accumulator's content is stored in C

$$\textcircled{2} \quad X = (A + B) * (C + D).$$

Load A These are all one address instruction.

Add B Load A to accumulator

Store B

Load C

Add D

Store D

Load B

Multiply D

Store X

SUNDAY 08

② 2-address instr : Both operand addresses are specified. The result is placed in one of the specified address

Move A, B → Content of B is loaded to A

Add A, C → A = A + C

W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	APRIL						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	2015

४ चैत्र कृष्ण सोमवार २०७९
चतुर्थी शेरां ५/५२
Hizri -17 Zamadilawal 1436
१ मार्च २०१५
Sunrise - 5.56 A.M.

MARCH
09
MONDAY

१४२८ फाल्गुन सोमवार १४२१
चतुर्थी शेः राः ५/५२
Saka - 18 Falgoon 1936
অহম - ২৮ ফাল্গুন ১৪২১
M.A Sunset - 5.38 P.M.

(Q) $x = (A+B)*(C+D)$

Add A, B

Add C, D

Multiply A,

None X, A.

(B) Three address machine :- In this two address are specified for the two operand and one address for result

$$(A+B)*(C+D) = X$$

Add A, B, C ← Add B, C and store it in A:

(Q) $X = (A+B)*(C+D)$

Add X, A, B

Add Y, C, D

Mult X, X, Y

Types of Processor

1) One - Address machine or A. c. based M/c.

It has one address bus which is connected to accumulator and machine register.

2) Two - address or 3 address machine or general purpose register base machine.

3) Zero - address machine or stack based machine.

MARCH	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T
2015	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

২৫ ফাল্গুন মঙ্গলবার ১৪২১
পঞ্চমী অহোরাত্র
Saka - 19 Falgoon 1936
অহম - ২৫ ফালুন ১৪২১
Sunrise - 5.55 A.M.

MARCH
10
TUESDAY

৫ চৈত্র কৃষ্ণ মঙ্গলবার ২০৭৭
পঞ্চমী (অহোরাত্র)
Hizri - 18 Zamadilawal 1436
১০ মার্চ ২০১৫
Sunset - 5.38 P.M.

① One-address machine :- This machine contains an accumulator register. Arithmetic, logical and comparison instruction of accumulator based machine contains the address of only one operator. It is implied that the other operand is in the accumulator. The result of the operation is placed in the accumulator. It is the designed feature of the processor, the first generation computers were of this type. Eg:- Intel 8085 processor.

② 2-address or 3-address machine :- Machine of this type contains a set of general purpose registers which also acts as accumulator for arithmetic, logical and comparison operator. Instruction of this machine contain two- or three address. In case of two address processor, the address of both operand are specified in the instruction. The result is placed in one of the specified accumulator. This type of architecture was design for the second generation of computers and micro-processors such as IBM - 360, 370, Intel - 8086. Two or three address machines are faster and more powerful than accumulator based machine/ one-address machine.

performed on the operands which are at or near the top of the stack. The stack oriented machine contains only a stack pointer which points to the stack top. An arithmetic instruction ~~ADD~~ ^{ADD} does not require any address. The ADD instruction pops two operands from the stack, adds them and push the result back to the stack.

Eg:- HP-3000

Different Instruction :- (INSTRUCTION CYCLES)

- ① Fetch Instruction → Brings instruction to the processor from memory
- ② Decode → Identify which type of instruction is it.
- ③ ~~Copy~~ Data Fetch (^{if reqd}) → fetch the operand from memory, it is not for register data fetch is not required.
- ④ Execution

These four are mandatory. After this, branching, jumps, etc. are optional.

These are called microoperations to keep it in the bus system for return to memory is optional.

For example, if you want to do a subtraction between two numbers, first it has to be converted into binary code, then it will be sent to the adder.

Now let's take an example of a subtraction. If we want to subtract 10101010 from 11001100, then we have to borrow 1 from the next bit.

823
194
936
21
M.

২৭ ফালগুন বৃহস্পতিবার ১৪২১
মঠী ঘঃ ৬/৮৭
Saka - 21 Falgoon 1936
অহম - ২৭ ফালগুন ১৪২১
Sunrise - 5.53 A.M.

MARCH
12
THURSDAY

६ चैत्र कृष्ण गुरुवार २०७९
पाठी घ ६/४९
Hizri - 20 Zamadilawal 1436
१२ मार्च २०१५
Sunset - 5.39 P.M.

PROCESSOR DESIGNING

	11	10	01	00	memory
					←
10					
11	(4)				

← 8 information in each row.
This can be 16 or 8.

4×8 require $2^8 \rightarrow$ bit for address
 for $1K \times 8$.
 \hookrightarrow 1024 bytes

10 bits are required.

4K x 16

Different Parts

- ① Instruction Register, \rightarrow 16 bit.
 - ② Address Register, \rightarrow Contains address of instruction,
 \rightarrow 12 bit
 - ③ Program Counter, \rightarrow 12 bit
This contains address of,
the instruction which will
be executed next
 - ④ Data Register \rightarrow 16 bit
 - ⑤ Accumulator Register - 16 bit,

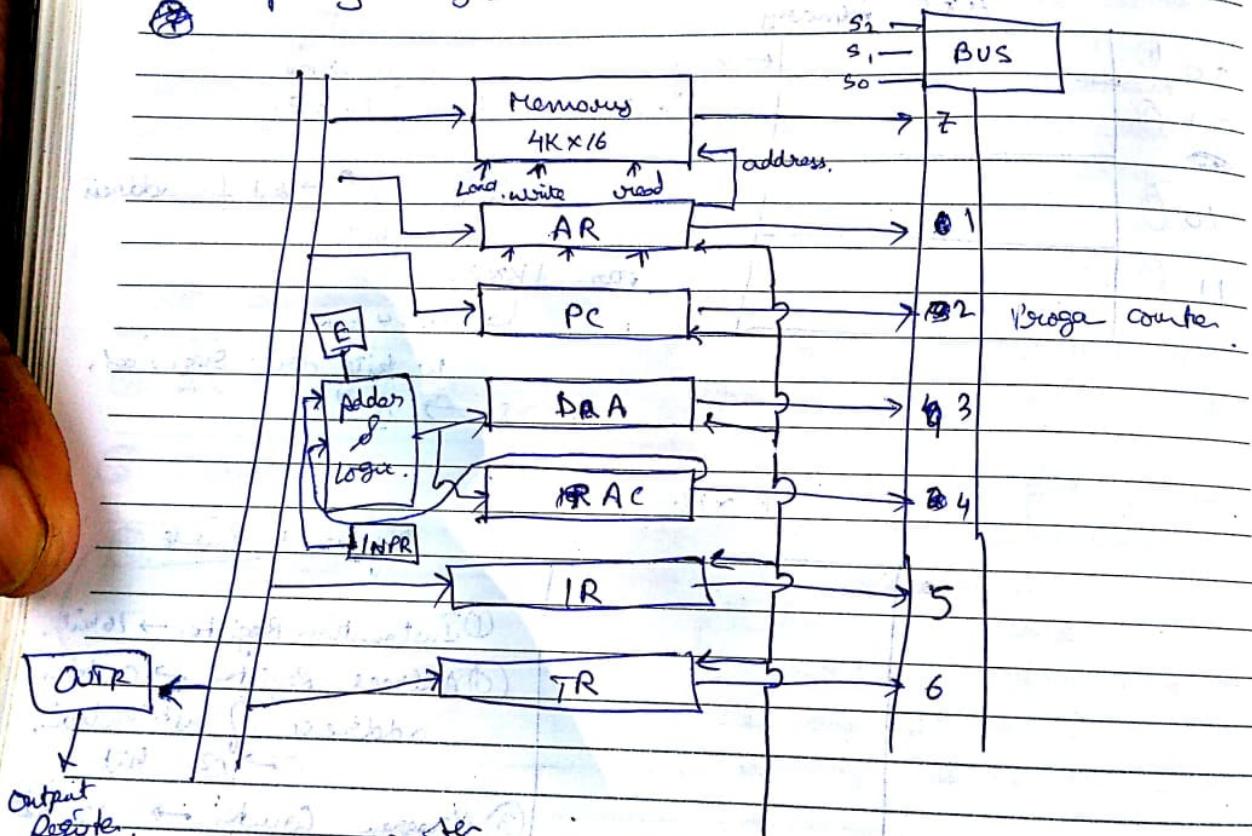
W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	APRIL						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	2015

੭/੮ ਚੈਤ੍ਰ ਕੁਲਾ ਸ਼ੁਕ੍ਰਵਾਰ ੨੦੭੧
 ਸਤਮੀ ਪ੍ਰਾਤ ੬/੨੯/ਅਦਮੀ ਸ਼ੋਤ੍ਰਾ ੫/੪੨
 Hizri -21 Zamadilawal 1436
 ੧੩ ਮਾਰ੍ਚ ੨੦੧੫
 Sunrise - 5.52 A.M.

MARCH
13
FRIDAY

২৮ ফাতেন শুক্রবার ১৪২১
সপ্তমী পাঃ ৬/২৯/অটো লিঃ রাঃ ৫/৪২
Saka - 22 Falgoon 1936
অহম - ২৮ ফাতেন ১৪২১
Sunset - 5.40 P.M.

③ Temporary Register \rightarrow Stores temporary result



Output
page

Register →
 S1 register →
 Input output register →
 S2 Input →
 and S flip flop →
 S flip flop →
 S flip flop →
 R / TEN →
 R / R(n) Register, 3x8 decoder → 1x16 decoder

CK → Direct address
 ↓ Indirect address
 3 bit

Value at this instant
 is to be operated
 with the value
 in the accumulator

flag input | flag output

16 bit common bus

Logic

२९-३० फाल्गुन शनि-रवि १४२१
नवमी शेःराः ८/२९/पश्चमी राः २/५२
Saka - 23-24 Falgoon 1936
अहम् - २९-३० फाल्गुन १४२१
Sunrise - 5.51-5.50 A.M.

MARCH
14
SATURDAY

९-१० वैत्र कृष्ण शनि-रवि २०७१
नवमी शोऽरात्र०/२९/दशमी रात्र० २/५२
Hizrl - 22-23 Zamadilawal 1436
१४-१५ मार्च २०१५
Sunset - 5.40-5.40 P.M.

OP Codes (3bit)

000 → AND

001 → ADD

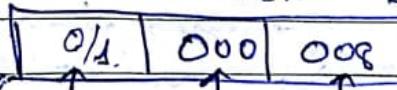
010 → LDA → Load to Accumulator,

011 → STA → Store Accumulator

100 → BUN → Branch unconditional

101 → BSA → Branch and Save

12 bit address is represented in Hexadecimal no as 12 bit is very long but Hexadecimal will be of 3 bit.

Eg:- 

it detects addressing mode.

Binary

This is in hexadecimal

0 → direct addressing

1 → indirect

0000 0000 0100 (in binary)

address

4567

in hexa

4567 81234.

0 100 0101 01100111
0 001 0010 00110100

Ace

1234

These are used for bops.

SUNDAY 15

101 → BSA (Branch and Save return address)

110 → INZ. In program we stop and go to some place. Then after the place is executed, this returns to the place where it has stopped. This place's address is saved here.

It depends on the designer.

jump and skip if 0.

W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	APRIL						
12	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	○	2015

Logic gates, Adder and logic circuit converted to the input of AC

११ चैत्र कृष्ण सोमवार २०७९
एकादशी रात १२/४८
Hizri -24 Zamadilawal 1436
१६ मार्च २०१५
Sunrise - 5.49 A.M.

MARCH
16
MONDAY

1 त्रैजा सोमवार १४२१
एकादशी रात १२/५८
Saka - 25 Falgoon 1836
अहम - १ च'तु १४२१
Sunset - 5.41 P.M.
24/8/15

Instruction format = 16 bit.



Instruction format has three types of ~~parts~~^{types} -

- ① Memory Reference instruction $\xrightarrow{2 \text{ types}} \begin{array}{l} \text{Direct addressing} \\ \text{Indirect addressing} \end{array}$
- ② Register " "
- ③ Input / output

Now if first 4 bit 0 000 } This is direct addressing
 0 010 } memory reference instruction

 1 000 } indirect addressing memory
 1 110 } reference instruction

The last 12 bit has a address.

Now if first 4 bit 0 111 } Note OP code \rightarrow 000
 1 000 } it is Register reference instruction
 1 100 }

The last 12 bit need not to be specified in this case

Now if first 4 bit 1 1110 } The I/O Reference instruction
 1 1000 } last 12 bit need not to be specified

MARCH	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T							
2015	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

२ चेत्र मंगलवार १४२१
द्वादशी रात १०/८९
Saka - 26 Falgoon 1936
अहम - २ चतुर्थ १४२१
Sunrise - 5.48 A.M.

MARCH

17

TUESDAY

१२ चैत्र कृष्ण मंगलवार २०७१

द्वादशी रात १०/४९
Hizri - 25 Zamadilawal 1436
१० मार्च २०१५
Sunset - 5.41 P.M.

Indirect address

Direct address

1 Add 345	35 0 Add 345	instruction already stored in memory,
345 1123 → Address	345 1123 → operand	
1123 → operand	1123 → operand	operd/ data.

1 2 3 4

0001 0010 0011 0100 → in Acc.

0001 0001 0010 0011 → in Acc.

Memory Reference instruction

1	DA	111	1
3	and	111	3

is given to decoder.

I. 000 → AND 6

001 → ADD 1

010 → 2

011 → 3

100 → 4

101 → 5

=	3x8	1
=	2	2
=	3	3
=	4	4
=	5	5
=	6	6
=	7	7

which ever pin
gets high, that
instruction is
then executed

१३ चैत्र कृष्ण बुधवार २०७९

त्रयोदशी रात ८/३१

Hizri - 26 Zamadilawal 1436

१८ मार्च २०१५

Sunrise - 5.47 A.M.



৩ চৈত্র বুধবার ১৪২১
অয়োদ্ধী রাত ৮/৩১
Saka - 27 Falgoon 1936
অহম - ৩ চ'ত ১৪২১
Sunset - 5.42 P.M.

Register Reference instruction :- Starts with 0111.

CLA → 7800 → Clear accumulator

0111 1000 0000 0000 → Inside instruction.

| 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

If this value is present then it clears accumulator.

Similarly

CLA 7800 → clear accumulator

CLE 7400 → clear E register

CMA 7200 → Complement accumulator

CME 7100 → Complement E register

CIR 7080 → Circulate right AC and E

CIL 7040 → Circulate Left AC and E

INC 7020 → increment AC → [E] → AC

SDA 7010 → skip next

৪ চেত্র বহস্পতিবার ১৪২১

চতুর্দশী সং ৬/০৭

Saka - 28 Falgoon 1936

অহম - ৪ চ'ত ১৪২১

Sunrise - 5.46 A.M.

MARCH

19

THURSDAY

১৪ চেত্র কৃষ্ণ গুরুবার ২০৭৭

চতুর্দশী সং ৬/০৭

Hizri - 27 Zamadilawal 1436

১৯ মার্চ ২০৭৫

Sunset - 5.42 P.M.

② Input / Output

format

F800

→ Input a character from
Keyboard

or

F400

→ F is constant.

INP → F800 → Input to ALU

OUT → Output from ALU → There is a flag

SKI → Skip if input flag is high

SK0 → Skip if output flag is high

I0 N → Interrupt off on

I0 F → Interrupt off

BUS

① S₀ S₁ S₂ ~~RS~~

0 1 0 → Address is taken to the bus from
program counter.

Then this is written to the
register whose load line is high.
(In this case AR is high)

S₁ I I → Takes info from memory and
then puts it to register whose
load line is high!

(In this case instruction Register (IR)
is high).

W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	F	S	S	M	T	W	F
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

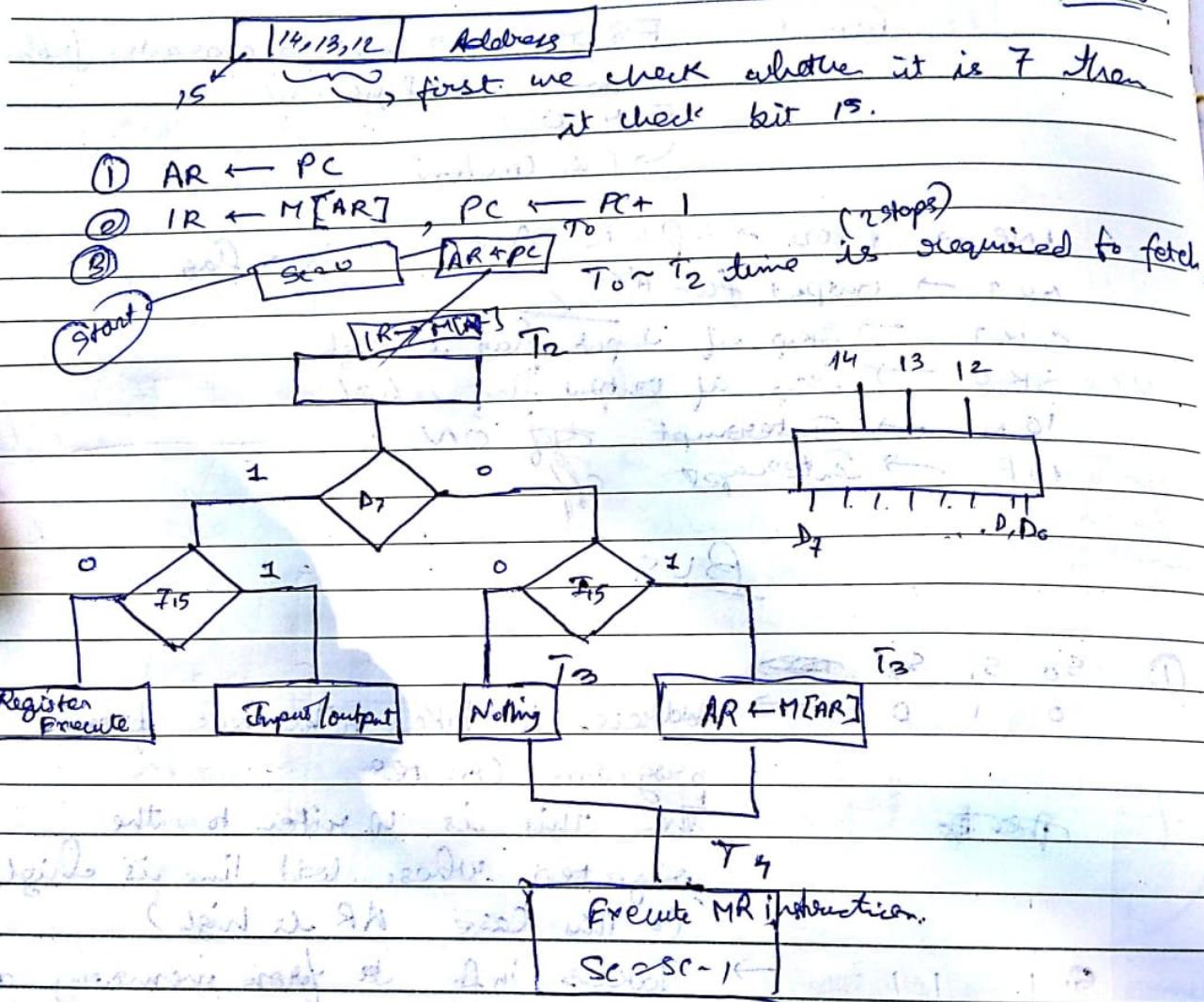
APRIL

2015

१५ चैत्र कृष्ण शुक्रवार २०७९
अमावस्या घो ३/४३
Hizri - 28 Zamadilawal 1436
२० मार्च २०१५
Sunrise - 5.45 A.M.

MARCH
20
FRIDAY

५ चैत्र शुक्रवार १४२१
अमावस्या घो ३/८३
Saka - 29 Falgoon 1936
अहम - ५ चैत्र १४२१
Sunset - 5.42 P.M.



MARCH	S	M	T	W	T	F	S	S	M	T	W	F	S	S	M	T	W	F	S	S	M	T	W	F	S					
2015	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

৬-৭ চৈত্র শনি-বুধা ১৪২১
প্রতিপদ ঘঃ ১/২৮/বিতীয়া ঘঃ ১১/১৮
Saka - 30-1 Falgoon-Chaitra 1936
অহম - ৬-৭ চ'ত ১৪২১
Sunrise - 5.44-5.43 A.M.

MARCH
21
SATURDAY

১-২ চৈত্র শুকল শনি-বুধা ২০৭২
প্রতিপদ ঘঃ ১/২৮/বিতীয়া ঘঃ ১১/১৮
Hizri-29-1 Zamadilawal-Zamadius-sani 1436
২১-২২ মার্চ ২০১৫
Sunset - 5.43-5.43 P.M.

৩/১৮/১৮

15 12-14 Address

Program Counter \rightarrow decides which instruction will be executed.

T_0 : instruction fetch $AR \leftarrow PC$

Fetch. T_1 : $IR \leftarrow M[AR]$, $PC \leftarrow PC + 1$

T_2 : $D_7 \dots D_0 \leftarrow \text{Decode}(12-14)$, $AR \leftarrow IR(0-11)$, $I \leftarrow IR(15)$

High at $\leftarrow T_0 = T_1 = T_2$

hence we can use it to enable

the etc.

use it to enable

etc etc.

Memory $\equiv 3 \times 8$

AR

LD CUR INC

PC

LD CUR INC

IR

LD CUR INC

3x8

2

1

2

5

4

3

2

1

0

1

2

3

4

5

6

7

8

9

0

1

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৩ চৈত্র শুকল সোমবার ২০৭২
তৃতীয়া ঘৰ ১/১৮
Hizri-2 Zamadius-sani 1436
২৩ মার্চ ২০১৫
Sunrise - 5.42 A.M.

MARCH
23
MONDAY

৪ চৈত্র সোমবার ১৪২১
তৃতীয়া ঘৰ ১/১৮
Saka - 2 Chaitra 1937
অহম - ৮ চ'তু ১৪২১
MARCH
Sunset - 5.43 P.M.

$T_4 D_1 : DR \leftarrow M[AR]$
 $T_5 D_1 : AC \leftarrow AC + DR, E \leftarrow AC$

$T_4 D_2 : DR \leftarrow M[AR]$
 $T_5 D_2 : AC \leftarrow DR, SC \leftarrow 0,$

$T_4 D_3 : E M[AR] \leftarrow AC, SC \leftarrow 0$
 $T_5 D_3 : M[AR] \leftarrow AC, SC \leftarrow 0.$

$T_4 D_4 : PC \leftarrow AR, SC \leftarrow 0$ [Skipping instruction]
 Branch of save address

$T_4 D_5 : M[AR] \leftarrow PC, AR \leftarrow AR+1$ 20 | 0 | 101 | 234

$T_5 D_5 : PC \leftarrow AR, SC \leftarrow 0, PC \rightarrow 21$

Here PC skips from 20 to 23y
 then continues executing till end
 then again come back to 23y
 then goes back to 21. Since
 it again executes from 21 \rightarrow the place where it left off.

MARCH	S	M	T	W	T	F	S	S	M	T	W	F	S	S	M	T	W	F	S	S	M	T									
2015	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

৯ চৈত্র মঙ্গলবার ১৪২১

চতুর্থী ঘঃ ৭/৮০

Saka - ৩ Chaitra 1937

অহম - ৯ চ'ত ১৪২১

Sunrise - 5.41 A.M.

MARCH
24
TUESDAY

৪ পঞ্চ শুক্ল মঙ্গলবার ২০৭২

চতুর্থী ঘঃ ৭/৪০

Hizri - ৩ Zamadius-sani 1436

২৪ মার্চ ২০৭৪

Sunset - 5.44 P.M.

INX

$s \leftarrow 0$

$T_4 D_6 : DR \leftarrow M[AR]$

$T_5 D_6 : DR \leftarrow DR + 1$

$T_6 D_6 : M[AR] \leftarrow DR$; If ($DR = 0$), Then $PC \leftarrow PC + 1$

② Register Reference Instruction

$T_2 D_7 I^1 I^1 : AC \leftarrow 0, SC \leftarrow 0$ $\rightarrow AR(0-11) \rightarrow IR(15)$

$T_3 D_7 I^1 I^1 : E \leftarrow 0, SC \leftarrow 0$ $\rightarrow I_0 I_1 \dots I_{11}$

$T_3 D_7 I^1 I^1 : AC \leftarrow AC, SC \leftarrow 0$

Memory Unit of Computer

7/9/18

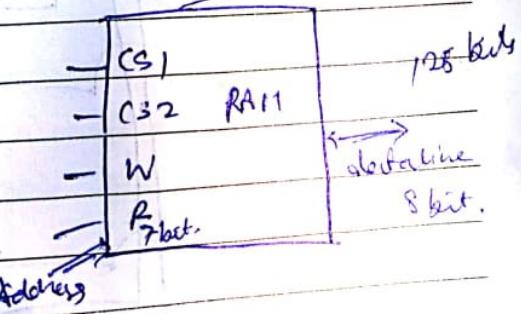
Primary Memory \rightarrow RAM \rightarrow We can write & Read on the memory.
ROM \rightarrow only read.

CPU can directly access these memory directly

1 KB \rightarrow 512 B \rightarrow RAM

512 B \rightarrow ROM

chip select 1/2



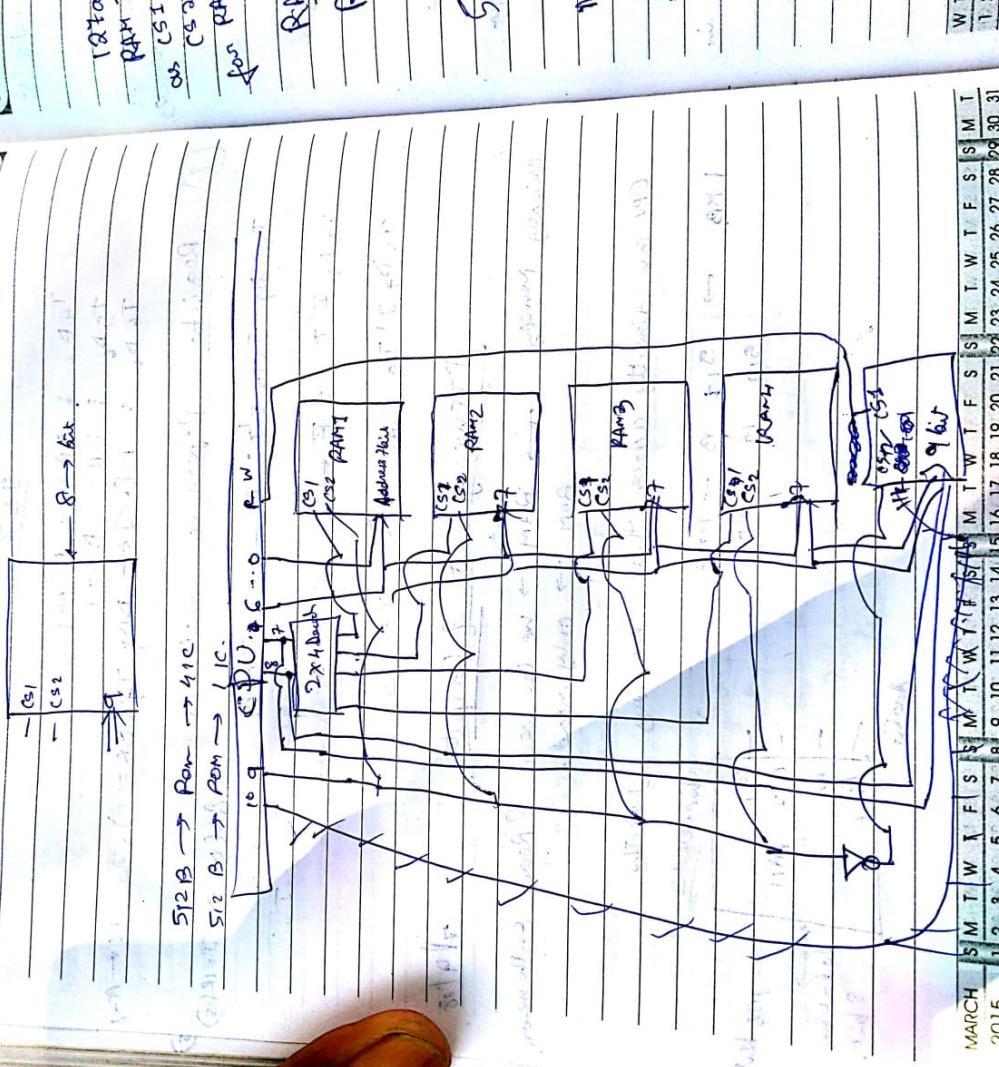
APRIL
S M T W T F S S M T W T F S S M T W T F
2015

५/६ चैत्र शुक्ल त्रियवार २०७२
परमी प्रांग ६/२५ लही गोठ १३८
Hizri-4 Zamadus-sani 1436
२५ मार्च २०१५
Sunrise - ५:४० A.M.

MARCH
25
WEDNESDAY

२० चैत्र शुक्ल त्रियवार २०७२
परमी प्रांग ६/२५ लही गोठ १३८
Saka - ५ Chaitra १५५
गत्ती लांग तांग ५
Saka - ५ Chaitra १५५
अद्यन - १० तंस ५८२
बज्जस - ११ टांग
Sunrise - ५:४४ A.M.
Sunset - ५:३९ P.M.

POM



MARCH	S	M	T	W	T	F	S	S	M	I																					
2015	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

१८२३
सं ४/५६
रा १९३७
१८२१
१४ P.M.
Saka - ५ Chaitra 1937
तारीख - ११ चूल्हा १८२१
Sunrise - 5:39 A.M.
11 चूल्हा दिवाली चूल्हा १८२१



MARCH
26

THURSDAY
Baasant Puja

७ फेब्रुअरी १९३७
मुहूर्त २०५२
श्री रोटो ५/८
हिन्दू - ५ जानूरा-जन १४३८
२५ पात्रे २०१५
Sunset - ५:४५ P.M.

	9	8	7	6	5	4	3	२	१	०
RAM 1	0	0	0	0	0	0	0	0	0	0
RAM 1.1	0	0	0	1	0	0	0	0	0	0
RAM 1.2	0	0	0	0	1	0	0	0	0	0
RAM 1.3	0	0	0	0	0	1	0	0	0	0
RAM 1.4	0	0	0	0	0	0	1	0	0	0
RAM 1.5	0	0	0	0	0	0	0	1	0	0
RAM 1.6	0	0	0	0	0	0	0	0	1	0
RAM 1.7	0	0	0	0	0	0	0	0	0	1
RAM 1.8	0	0	0	0	0	0	0	0	0	1
RAM 1.9	0	0	0	0	0	0	0	0	0	1
RAM 1.10	0	0	0	0	0	0	0	0	0	1
RAM 1.11	0	0	0	0	0	0	0	0	0	1
RAM 1.12	0	0	0	0	0	0	0	0	0	1
RAM 1.13	0	0	0	0	0	0	0	0	0	1
RAM 1.14	0	0	0	0	0	0	0	0	0	1
RAM 1.15	0	0	0	0	0	0	0	0	0	1
RAM 1.16	0	0	0	0	0	0	0	0	0	1
RAM 1.17	0	0	0	0	0	0	0	0	0	1
RAM 1.18	0	0	0	0	0	0	0	0	0	1
RAM 1.19	0	0	0	0	0	0	0	0	0	1
RAM 1.20	0	0	0	0	0	0	0	0	0	1
RAM 1.21	0	0	0	0	0	0	0	0	0	1
RAM 1.22	0	0	0	0	0	0	0	0	0	1
RAM 1.23	0	0	0	0	0	0	0	0	0	1
RAM 1.24	0	0	0	0	0	0	0	0	0	1
RAM 1.25	0	0	0	0	0	0	0	0	0	1
RAM 1.26	0	0	0	0	0	0	0	0	0	1
RAM 1.27	0	0	0	0	0	0	0	0	0	1
RAM 1.28	0	0	0	0	0	0	0	0	0	1
RAM 1.29	0	0	0	0	0	0	0	0	0	1
RAM 1.30	0	0	0	0	0	0	0	0	0	1
RAM 1.31	0	0	0	0	0	0	0	0	0	1
RAM 1.32	0	0	0	0	0	0	0	0	0	1
RAM 1.33	0	0	0	0	0	0	0	0	0	1
RAM 1.34	0	0	0	0	0	0	0	0	0	1
RAM 1.35	0	0	0	0	0	0	0	0	0	1
RAM 1.36	0	0	0	0	0	0	0	0	0	1
RAM 1.37	0	0	0	0	0	0	0	0	0	1
RAM 1.38	0	0	0	0	0	0	0	0	0	1
RAM 1.39	0	0	0	0	0	0	0	0	0	1
RAM 1.40	0	0	0	0	0	0	0	0	0	1
RAM 1.41	0	0	0	0	0	0	0	0	0	1
RAM 1.42	0	0	0	0	0	0	0	0	0	1
RAM 1.43	0	0	0	0	0	0	0	0	0	1
RAM 1.44	0	0	0	0	0	0	0	0	0	1
RAM 1.45	0	0	0	0	0	0	0	0	0	1
RAM 1.46	0	0	0	0	0	0	0	0	0	1
RAM 1.47	0	0	0	0	0	0	0	0	0	1
RAM 1.48	0	0	0	0	0	0	0	0	0	1
RAM 1.49	0	0	0	0	0	0	0	0	0	1
RAM 1.50	0	0	0	0	0	0	0	0	0	1
RAM 1.51	0	0	0	0	0	0	0	0	0	1
RAM 1.52	0	0	0	0	0	0	0	0	0	1
RAM 1.53	0	0	0	0	0	0	0	0	0	1
RAM 1.54	0	0	0	0	0	0	0	0	0	1
RAM 1.55	0	0	0	0	0	0	0	0	0	1
RAM 1.56	0	0	0	0	0	0	0	0	0	1
RAM 1.57	0	0	0	0	0	0	0	0	0	1
RAM 1.58	0	0	0	0	0	0	0	0	0	1
RAM 1.59	0	0	0	0	0	0	0	0	0	1
RAM 1.60	0	0	0	0	0	0	0	0	0	1
RAM 1.61	0	0	0	0	0	0	0	0	0	1
RAM 1.62	0	0	0	0	0	0	0	0	0	1
RAM 1.63	0	0	0	0	0	0	0	0	0	1
RAM 1.64	0	0	0	0	0	0	0	0	0	1
RAM 1.65	0	0	0	0	0	0	0	0	0	1
RAM 1.66	0	0	0	0	0	0	0	0	0	1
RAM 1.67	0	0	0	0	0	0	0	0	0	1
RAM 1.68	0	0	0	0	0	0	0	0	0	1
RAM 1.69	0	0	0	0	0	0	0	0	0	1
RAM 1.70	0	0	0	0	0	0	0	0	0	1
RAM 1.71	0	0	0	0	0	0	0	0	0	1
RAM 1.72	0	0	0	0	0	0	0	0	0	1
RAM 1.73	0	0	0	0	0	0	0	0	0	1
RAM 1.74	0	0	0	0	0	0	0	0	0	1
RAM 1.75	0	0	0	0	0	0	0	0	0	1
RAM 1.76	0	0	0	0	0	0	0	0	0	1
RAM 1.77	0	0	0	0	0	0	0	0	0	1
RAM 1.78	0	0	0	0	0	0	0	0	0	1
RAM 1.79	0	0	0	0	0	0	0	0	0	1
RAM 1.80	0	0	0	0	0	0	0	0	0	1
RAM 1.81	0	0	0	0	0	0	0	0	0	1
RAM 1.82	0	0	0	0	0	0	0	0	0	1
RAM 1.83	0	0	0	0	0	0	0	0	0	1
RAM 1.84	0	0	0	0	0	0	0	0	0	1
RAM 1.85	0	0	0	0	0	0	0	0	0	1
RAM 1.86	0	0	0	0	0	0	0	0	0	1
RAM 1.87	0	0	0	0	0	0	0	0	0	1
RAM 1.88	0	0	0	0	0	0	0	0	0	1
RAM 1.89	0	0	0	0	0	0	0	0	0	1
RAM 1.90	0	0	0	0	0	0	0	0	0	1
RAM 1.91	0	0	0	0	0	0	0	0	0	1
RAM 1.92	0	0	0	0	0	0	0	0	0	1
RAM 1.93	0	0	0	0	0	0	0	0	0	1
RAM 1.94	0	0	0	0	0	0	0	0	0	1
RAM 1.95	0	0	0	0	0	0	0	0	0	1
RAM 1.96	0	0	0	0	0	0	0	0	0	1
RAM 1.97	0	0	0	0	0	0	0	0	0	1
RAM 1.98	0	0	0	0	0	0	0	0	0	1
RAM 1.99	0	0	0	0	0	0	0	0	0	1
RAM 1.100	0	0	0	0	0	0	0	0	0	1
RAM 1.101	0	0	0	0	0	0	0	0	0	1
RAM 1.102	0	0	0	0	0	0	0	0	0	1
RAM 1.103	0	0	0	0	0	0	0	0	0	1
RAM 1.104	0	0	0	0	0	0	0	0	0	1
RAM 1.105	0	0	0	0	0	0	0	0	0	1
RAM 1.106	0	0	0	0	0	0	0	0	0	1
RAM 1.107	0	0	0	0	0	0	0	0	0	1
RAM 1.108	0	0	0	0	0	0	0	0	0	1
RAM 1.109	0	0	0	0	0	0	0	0	0	1
RAM 1.110	0	0	0	0	0	0	0	0	0	1
RAM 1.111	0	0	0	0	0	0	0	0	0	1
RAM 1.112	0	0	0	0	0	0	0	0	0	1
RAM 1.113	0	0	0	0	0	0	0	0	0	1
RAM 1.114	0	0	0	0	0	0	0	0	0	1
RAM 1.115	0	0	0	0	0	0	0	0	0	1
RAM 1.116	0	0	0	0	0	0	0	0	0	1
RAM 1.117	0	0	0	0	0	0	0	0	0	1
RAM 1.118	0	0	0	0	0	0	0	0	0	1
RAM 1.119	0	0	0	0	0	0	0	0	0	1
RAM 1.120	0	0	0	0	0	0	0	0	0	1
RAM 1.121	0	0	0	0	0	0	0	0	0	1
RAM 1.122	0	0	0	0	0	0	0	0	0	1
RAM 1.123	0	0	0	0	0	0	0	0	0	1
RAM 1.124	0	0	0	0	0	0	0	0	0	1
RAM 1.125	0	0	0	0	0	0	0	0	0	1
RAM 1.126	0	0	0	0	0	0	0	0	0	1
RAM 1.127	0	0	0	0	0	0	0	0	0	1
RAM 1.128	0	0	0	0	0	0	0	0	0	1
RAM 1.129	0	0	0	0	0	0	0	0	0	1
RAM 1.130	0	0	0	0	0	0	0	0	0	1
RAM 1.131	0	0	0	0	0	0	0	0	0	1
RAM 1.132	0	0	0	0	0	0	0	0	0	1
RAM 1.133	0	0	0	0	0	0	0	0	0	1
RAM 1.134	0	0	0	0	0	0	0	0	0	1
RAM 1.135	0	0	0	0	0	0	0	0	0	1
RAM 1.136	0	0	0	0	0	0	0	0	0	1
RAM 1.137	0	0	0	0</td						

১৩-১৪ তেব্র শনিবার ১৮২১
নবমী আবহাস/নবমী থাঃ ৬/১০
সকা - ৭-৮ Chaitra 1937
তাহার - ১৩-১৪ টত ১৮২১
Sunrise - ৫.৩৭-৫.৩৬ A.M.

MARCH
28
SATURDAY

Ramnabami

Box Name Speed ৫০

Cat Speed ৫০
Hit Ratio \approx 0.9.

Hence for ১০০ Oldates

$$180 \times 60 + 20 \times 500 = 95000$$

Mapping or Transformation of data from main memory to cache memory is known as Mapping.

There are three type of Mapping.

- ① Associative Mapping
- ② Direct Mapping
- ③ Set - Associative mapping.

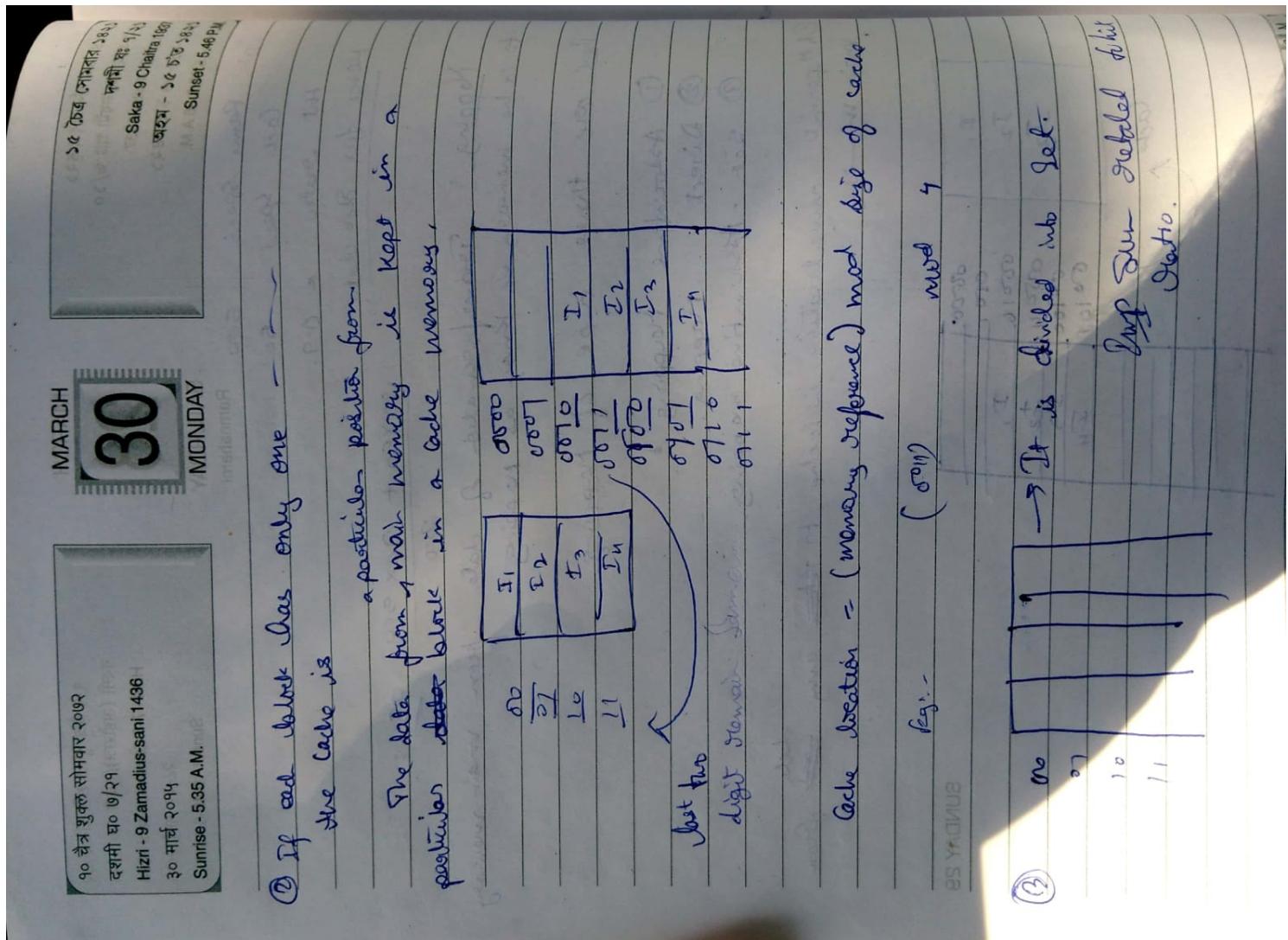
Q. Why permits one location in cache to ~~store~~ any ~~data~~ from main memory. (Ans) Cache is distributed in nature.



১৩-১৪ তেব্র শনিবার ১৮২১
নবমী (অহোরাত্র) /নবমী সাং ৬/১০
Hizni - ৭-৮ Zamadius-sani 1436
২০-২১ মার্চ ২০১১
Sunset - ৫.৪৫-৫.৪৬ P.M.

১-৯ ঈশ্বর শুক্ল শনিবার ২০৭২
নবমী (অহোরাত্র) /নবমী সাং ৬/১০
Hizni - ৭-৮ Zamadius-sani 1436
২০-২১ মার্চ ২০১১
Sunset - ৫.৪৫-৫.৪৬ P.M.

W	T	S	M	T	W	F	S	S	M	T	W	F	S	S	M	T	W	F	S	S	M	T	W	F	A	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	APRIL



१२ दैत्र शुक्ल तुष्णिवार २०७२
दसदीर्घा धू १०/५१
Hizri-11 Zamadus-sani 1436
१ अप्रैल २०१५
Sunrise - 5.33 A.M.

୧୯ ଦିନେ ବୁଦ୍ଧିରେ ୧୪୫	ଶାମି ସଂ ୨୦/୧୫	Saka - 11 Chaitra 19	ଅର୍ଦ୍ଧ - ୧୧ ଫେବୃଆରୀ ୧୯୫	Sunset - 5:47 PM	Sumit
୨୦	ବୁଦ୍ଧିରେ	Saka	ଅର୍ଦ୍ଧରେ		

ଦେବ ବ୍ୟକ୍ତିଗତ ୧୪୫	ଶାନ୍ତି ସଂ ୧୦/୧	କା - ୧୧ Chaitra ୧୯୮୩	୧୨୫
ସାହୁ	Saka	ସମୟ - ୧୨ ଟଙ୍କ ୪୮	Sunset - 5.47 P.M.

WEDNESDAY
Early Bank Closing Day

Direct mapping

$\text{CPU} = 345 \text{ ms}$ \Rightarrow In this case $\log_2 3 = 1.58$

Tag, Index We go to cache at address = 70.
 Index = 70.

Tag = (Main memory address - Cache Address) \rightarrow 12th bit \sim 8th bit
Index \rightarrow Cache memory address

In Associate mapping if there is a miss and no space is present in Cache, then evicting occurs and the data is brought from main to Cache. ~~old data~~ should be replaced by new data. ~~old data~~ This cache is fixed. By the architecture

Guiding Adv.: no searching, i.e., ~~space~~, i.e., less need:

Die drei in fix Grünewald Wandmalerei

Scanned by CamScanner

APRIL



THURSDAY
Mahabir Jayanti

१५ चतुर्थ बृहस्पतिवार १४२१
वर्षायामी शं १२/५६
वर्षायामी १२ Chaitra 1937
Saka - १८ च'त १४२१
ठहरा - १८ च'त १४२१
सुनिशे - ५.३२ A.M.

१३ चैत्र शुक्ल गुरुवार २०७२
त्रयोदशी ध० १२/५६
Hizri-12 Zamadius-sani1436
२ अप्रैल २०१४
Sunset - ५.४७ P.M.

we will go to workplace again and again.

Set - Associative mapping.

If there is a miss, then a block of data after the address is copied to cache memory (assuming that those next data will be used).

Cache



२ वैशाख कृष्ण सोमवार २०७२
द्वितीया रात्र ७/३९
Hizri-16 Zamadius-sani 1436
६ अप्रैल २०१५
Sunrise - 5.29 A.M.

APRIL
06
MONDAY

২২ ত্রেত শোভাবর ১৪২।
দিতীয়া রাঃ ৭/৫৭
Saka - 16 Chaitra 1937
অক্ষা - ২২ ট' ট' ১৪২।
Sunset - 5.49 P.M.

- 1 -

- ⑦ Capacity miss \rightarrow data cannot be brought due to $n\%$ capacity overhead
 - ⑧ Compulsory miss \rightarrow data is not present in cache
 - ⑨ Conflict miss \rightarrow data with same index cannot be present more than once at a time

Pipeline: Divide & Conquer 24/9/18

Pipeline is a technique of dividing a process in a number of sub-processes and then the sub-processes are executed simultaneously, i.e., if you start studies ~~at~~ simultaneously.

Shade / Screen → Combination of screen &

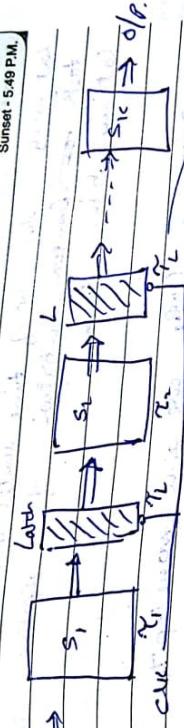
We use pipeline processor \rightarrow "time is less".
We don't use sequential processor \rightarrow time of program is more.

ମୋହାର ୧୪୨୩
ବିଜୁଯା ରାତ ୧/୧୮
ତତ୍ତ୍ଵିଳୀ ୧୬ Chaitra 1937
ସାତେ - ୧୭ Chaitra 1937
କାହାତେ - ୨୦ ଚାତ୍ର ୧୪୨୩
ସୂର୍ଯ୍ୟ - ୫:୨୮ A.M.
Sunset - ୫:୪୯ P.M.

ମୋହାର ୧୪୨୩
ବିଜୁଯା ରାତ ୧/୧୮
ତତ୍ତ୍ଵିଳୀ ୧୬ Chaitra 1937
ସାତେ - ୧୭ Chaitra 1937
କାହାତେ - ୨୦ ଚାତ୍ର ୧୪୨୩
ସୂର୍ଯ୍ୟ - ୫:୨୮ A.M.
Sunset - ୫:୪୯ P.M.

APRIL
07
TUESDAY

୩ ବୈଷଣି କୂଣ ମହିତବାର ୨୦୯୩
Hizh-17 Zamadus-sani1436
୭ ଅମ୍ବତ ୨୦୧୪
Sunset: ୫:୪୯ P.M.



$$\text{Time passed} = \max \{ T_1 + T_2 \}$$

Reservation table \rightarrow this register is busy, i.e. it is entering an inserted

S ₁	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
S ₂															
S ₃															
S ₄															

Eg:

S ₁	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
S ₂															
S ₃															
S ₄															



From both the table we can make only one pipeline

F	S	S	M	T	W	T	F	S	S	M	T	W	F	S	S
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

MAY

2015

8 अप्रैल कृष्ण शुभार 2092
चतुर्थी गो ४/२८
Hirni-18 Zamadius-sani 1436
८ अप्रैल 2094
Sunrise - 5:27 A.M.

APRIL

08

WEDNESDAY

२४ चूर्य समवार १४३
चृष्टिकृष्ण शुभा ४/२८
Saka - 18 Chaitra / 1987
अद्यम - २४ चृष्टि १४३
Sunset - 5:49 P.M.

Latency :- The no. of time units (clock cycle) between two task initiation of a pipeline is a latency between them.

Collision :- When we give more inputs to the collision memory (ram).

x_1	x_2	x_1	x_2	x_1	x_2	x_1	x_2
x_1	x_2	x_1	x_2	x_1	x_2	x_1	x_2
x_1	x_1	x_2	x_1	x_2	x_1	x_2	x_1
x_1	x_1	x_2	x_1	x_2	x_1	x_2	x_1
1	2	3	4	5	6	7	8
							9

Collision :- Any attempt by two or more initiation one to use the same space at the same time is called a collision.

Instruction of pipeline

Load R1 A
Load R2 B

Load R3 C
Sum R1 R2 → Add both and ~~store~~ put it in R1
Add R1 R3 → So until this step decreases sum,
we can't take R1

Friction

R

w

W

16

1D

-

F

APRIL

WTFSMSMTWFSSMTWFSMSMTWFS

୨୫ ଦିନ ସହାରିତିବାର ୧୪୨୯
କଲ୍ପନା ରୀତ ୮/୦୭
Saka - ୧୯ Chaitra 1937
ଅହୁମ - ୨୫ ମେ ଡିନ ୧୪୨୯
Sunrise - 5.26 A.M.

APRIL
09
THURSDAY

APRIL

8

THURSDAY

interventions.

	1	2	3	4	5	6	7	8	9	0
S ₁	1F ₁	1F ₂	1F ₃	1F ₄	1F ₅					
S ₂	1D ₁	1D ₂	1D ₃	1D ₄	1D ₅					
S ₃	1P ₁	1P ₂	1P ₃	1P ₄	1P ₅					
S ₄	1S ₁	1S ₂	1S ₃	1S ₄	1S ₅					

1F → integris fetu

Pipe line oil Haigard

24

$1E \rightarrow 11$ execute.

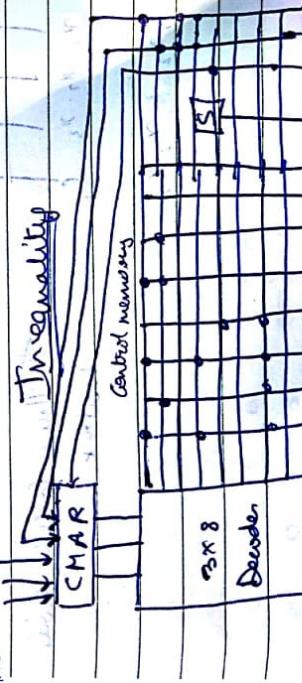
140 types

卷之三

RAW	→ Read after write
WAN	→ Write after write
WAK	→ Write after Read

Journal Source

10 / 18



Content		Signed		Fingered		Signature		Smith		Jewell		Browns		Institute		Purchased will be sold		Similarly address		a) C1 C2 C3 C4 C5 C6 C7 C8 C9 C10											
FS	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	MAY															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	2015

Scanned by CamScanner

६ वैशाख कृष्ण शुक्रवार २०७२
षष्ठी रात ७/१९
Hilz-20 Zamadius-sani 1436
१० औसत २०१५
Sunrise - 5.25 A.M.

APRIL 10 FRIDAY

APRIL

10

FEB 1 DAY

২৬ তেজ শুক্রবার ১৪২১
 বঙ্গী মাঃ ৭/১৯
 Saka - 20 Chaitra 1937
 আহুম - ২৬ ট'ত ১৪২১
 Sunset - 5.50 P.M.

୧୪୯ ପର୍ଯ୍ୟନ୍ତ ଓଡ଼ିଆ

বাংলা ১/১৯

Sakta - 20 Chaitra 1927

Sarkar • 20 Chaitanya

ଅନ୍ତର୍ଜାଲ - ୨୬ ଟେଲ୍ ୧୯୮୨୯

Sunset - 5.50 P.M.

A set of isolated micro-instruction is called micro-program.

The control signal to be activated is sent by micro-instr.

Microbiota - host-gut - 2 parts

- ① A set of control bit to enable the control line
 - ② An address bit which will be used to identify the memory of the next miss instruction to be activated.

The content memory organized as a read only memory is a direct storage.

卷之三

卷之三

人間の精神

222

卷之三

卷之三

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Widder, H. 1990. *Die Entwicklung der Pflanzengesellschaften im Bereich des Tiefenbach- und Wiedertal im Bereich des Naturparks Eifel*. Unpublished Ph.D. thesis, University of Bonn.

卷之三

卷之三

୨୧-୨୮ ଦେସ୍ୟ ଶାନ୍ତିକାଳୀ ୧୪୨୧
ମହୀୟ ୬/୦୧/୨୦୨୩ ଅର୍ଥାତ୍ ୫୦୯୧୦୧୦୧
Saka - ୨୧-୨୨ Chaitra 1937
ଆମ୍ବା - ୨୧-୨୮ ଚତୁର୍ଦ୍ଦିଶ୍ୱାସୀ ୧୪୨୧
Sunrise - ୫.୨୪-୫.୨୩ A.M.

APRIL 11 SATURDAY

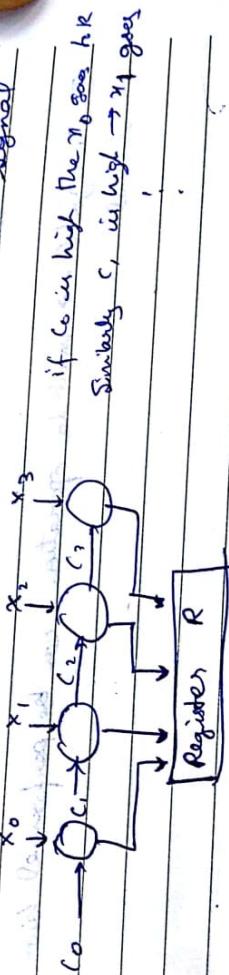
५-२ देशराज कुमा यन्मिति २०७२
समाप्ति १० ३/०१/२०७२ ३० ५/२२
Hinu-21-22 Zamindas-sam/1496
०६-१२ अक्टूबर २०७४
Sunset - ५/२२

Sunset - 5.51-5.51 P.M.

When Six Bits, a condition or address, and hence that instruction is executed next.

① Horizontal - During an individual bit for each control signal in the micro instruction formed as one control signal.

② Vertical micro-instrutor -
Single bit can produce an encode signal



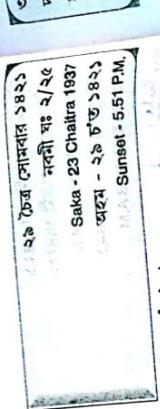
SUNDAY 12			
c_0	c_1	c_2	c_3
0	0	0	0
1	0	0	0
0	1	0	0
0	0	1	0
0	0	0	1
0	0	0	0
\rightarrow No operation.			
$R \leftarrow x_0$	$R \leftarrow x_1$	$R \leftarrow x_2$	$R \leftarrow x_3$
$\lceil \log_2 n \rceil$	$\lceil \log_2 n \rceil$	$\lceil \log_2 n \rceil$	$\lceil \log_2 n \rceil$

Hence only 3 letters in

૨૦૭

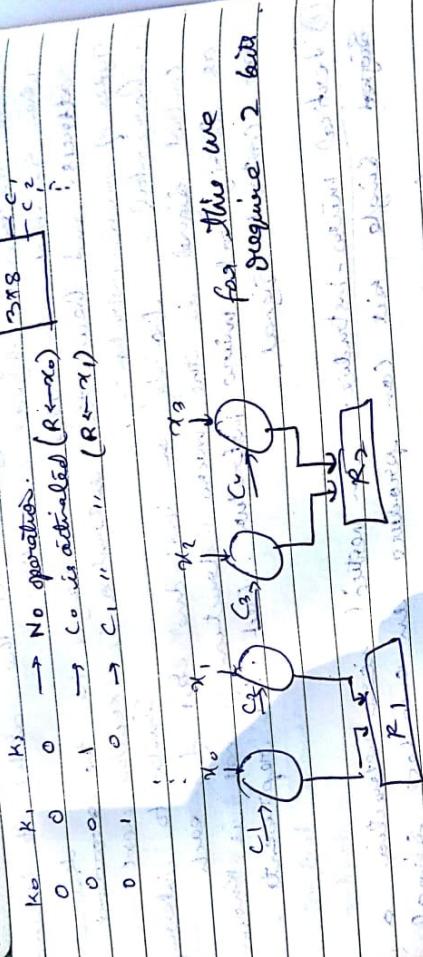
	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	I	F	S	S	MAY								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	2015

I W T F S S M T W I F S S M

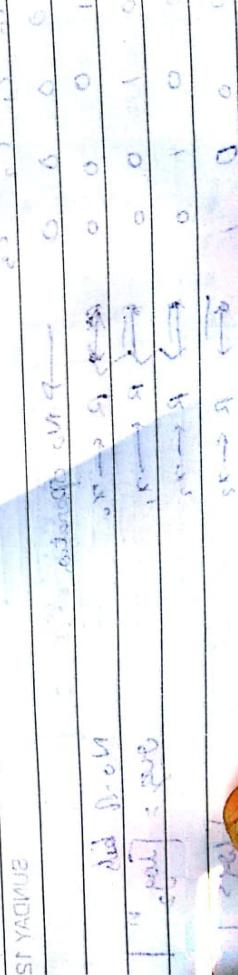


APRIL
13
MONDAY

	K ₁	K ₂
0	0	\rightarrow No operation.
0	1	\rightarrow C ₀ is activated ($R \leftarrow x_0$)
0	0	\rightarrow $(R \leftarrow x_1)$
0	1	\rightarrow C ₁ , \dots



In horizontal \rightarrow multiple operation can be performed. but not in vertical



9

ST YACINIE

