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தமிழ் நாடு அரசு
தொழில்நுட்பக் கல்வித் துறை, சென்னை 600 025 - வாரியத் தேர்வுகள்
அடுத்தப் பக்கத்தில் கொடுக்கப்பட்டுள்ள குறிப்புகளை படிக்கவும் (Read the instructions given in the next page)

Q. No.	A	B	C	Q. No.	A	B	C	Q. No.	A	B	C	Q. No.	A	B	C
1.				9.				17.				25.			
2.				10.				18.				26.			
3.				11.				19.				27.			
4.				12.				20.				28.			
5.				13.				21.				29.			
6.				14.				22.				30.			
7.				15.				23.				31.			
8.				16.				24.				Total Marks			

For Revaluation

For Central Valuation

Q. No.	A	B	C	Q. No.	A	B	C	Q. No.	A	B	C	Q. No.	A	B	C
1.			9	9.	7			17.				25.			
2.		9		10.	6			18.				26.			
3.		7	8	11.				19.				27.			
4.		5		12.	7			20.				28.			
5.	8	7		13.				21.				29.			
6.				14.				22.				30.			
7.				15.				23.							
8.				16.				24.							

591-1324-24506362



Marks

73

Question Paper Code No.

வினாத்தாளின் குறியீட்டு எண்

1 3 2 4

No. of எழுத்து

80

Date of Examination :

தேர்வு நாள்

13.11.2024

Subject Name :

புடத்தின் பெயர்

Digital Logic Design

Perforations to tear fly slip

Inputs		Output
A	B	$Y = A \cdot B$
0	0	0
0	1	0
1	0	0
1	1	1

தேர்வாளர்களுக்கான அறிவுரைகள்
INSTRUCTIONS TO CANDIDATES

1. விடைத்தாள் மாற்றிப் பெறுவதற்கு.

Get the answer book replaced, if

- விடைத்தாள் சரியாக சேர்ந்து பின் செய்யப்படாமல் இருந்தால்.
- it is not stapled properly
- விடைத்தாள் புத்தகப் பக்கங்களின் வரிசை எண் விடுபட்டிருந்தாலோ அல்லது வரிசையாக இல்லாமலிருந்தாலோ (மொத்தம் 30 பக்கங்கள்).
- the page numbers are missing or not in order (there shall be 30 pages continuously numbered)
- தலைப்பு பக்கத்தில் விடைத்தாள் புத்தகத்தின் கீழ்பகுதியில் வரிசை எண் அச்சிடப்படாமலிருந்தால்.
- the serial number of the answer book is not printed at the bottom of the title page

2. உங்களுடைய பதிவு எண்ணையும், பெயரையும் அதற்காக கொடுக்கப்பட்டுள்ள தலைப்பு பக்கத்தின் கீழ்பகுதியில் மட்டும் எழுதவும்: அதைத் தவிர்த்து பதிவு எண், பெயர் ஆகியவற்றை விடைத்தாளில் மற்றப் பக்கங்களில் எழுதக்கூடாது. எந்தவிதமான அடையாளக் குறியீட்டையும் விடைத்தாளில் எழுதக்கூடாது.

You are prohibited from writing your REGISTER NUMBER or NAME in any part of the answer book, other than the space provided at the bottom of the title page. You are prohibited from writing or leaving any distinguishing marks so as to identify your answer book.

3. தலைப்புப் பக்கத்தில் கொடுக்கப்பட்டுள்ள அதற்குரிய கட்டங்களில் விவரங்களை எழுதவும்.

Fill up all the particulars, in the relevant boxes, in the title page.

4. கேள்விகளுக்கு பதில் எழுதும் போது விடைத்தாளில் இரண்டு பக்கங்களையும் பயன்படுத்த வேண்டும். பக்கங்களில் தொடர்ந்து விடை எழுதாமல் வெற்றிடம் விடக் கூடாது.

Use both sides of the paper for answering questions, without leaving spaces/ lines in between.

5. இந்த விடைத்தாள் புத்தகம் போதுமான பக்கங்களை கொண்டிருக்கிறது. இதைத் தவிர கூடுதல் விடைத்தாள் அளிக்கப்படமாட்டாது.

This answer book contains sufficient pages and no additional sheets will be issued.

6. கேள்விக்கு விடையளிக்கும் முன்பு வினாத்தாள் எண், வருடம், மாதம், காலம் இவைகளை சரிபார்க்கவும்.

Check the Code Number, Month and year of Examination, Duration etc., in the question paper before answering the questions.

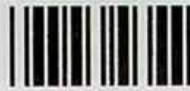
7. கொடுக்கப்பட்டுள்ள வரைப்படத்தாள் / கிராப் ஷீட் தவிர வேறு எந்த விடைத்தாளையும் சேர்க்க கூடாது. விடைத்தாள் புத்தகத்திலிருந்து எந்த பக்கத்தையும் கிழிக்கக் கூடாது.

No extra sheet is to be attached except the drawing/graph sheets supplied and no sheet is to be torn from the answer book.

8. கைபேசி, துண்டுக் காகிதம் மற்றும் தடை செய்யப்பட்ட இதர பொருட்கள் வைத்திருத்தல், தேர்வுக்கு எதிரான முறைகேடுகளில் ஈடுபடுதல் அனைத்தும் தேர்வு வாரிய விதிகளின்படி தண்டனைக்குரிய குற்றமாகும்.

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9. தேர்வு அலுவலக அங்கீகரிக்கப்பட்ட எந்தவிதமான டிஜிட்டல் கையெழுத்தும், கையெழுத்தும் அடித்த



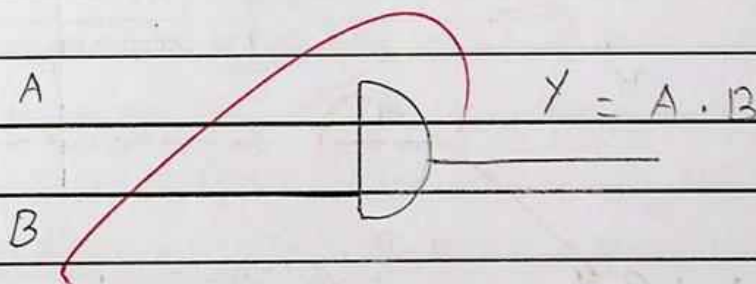
1. c) Logic Gates

1) AND gate

* The operation of AND gate is multiplication.

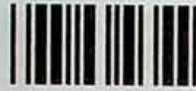
* It contains two inputs and one output.

Circuit Diagram



Truth table

Inputs		Output
A	B	$Y = A \cdot B$
0	0	0
0	1	0
1	0	0
1	1	1

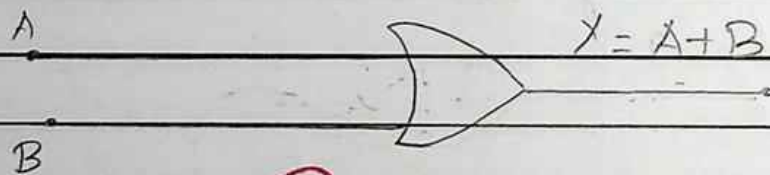


2) OR gate

* The operation of OR gate is addition.

* It contains two inputs and one output.

Circuit Diagram:



Truth table

Inputs		Output
A	B	$Y = A + B$
0	0	0
0	1	1
1	0	1
1	1	1

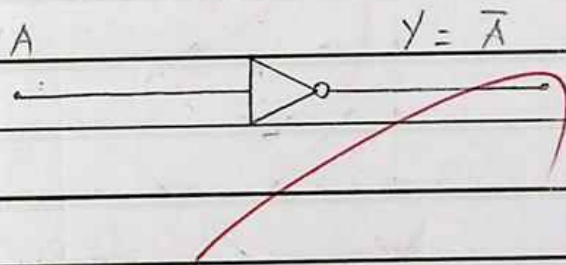


3) NOT gate

* The operation of NOT gate is inverse the given inputs.

* It contains only one input and one output.

Circuit Diagram



Truth table

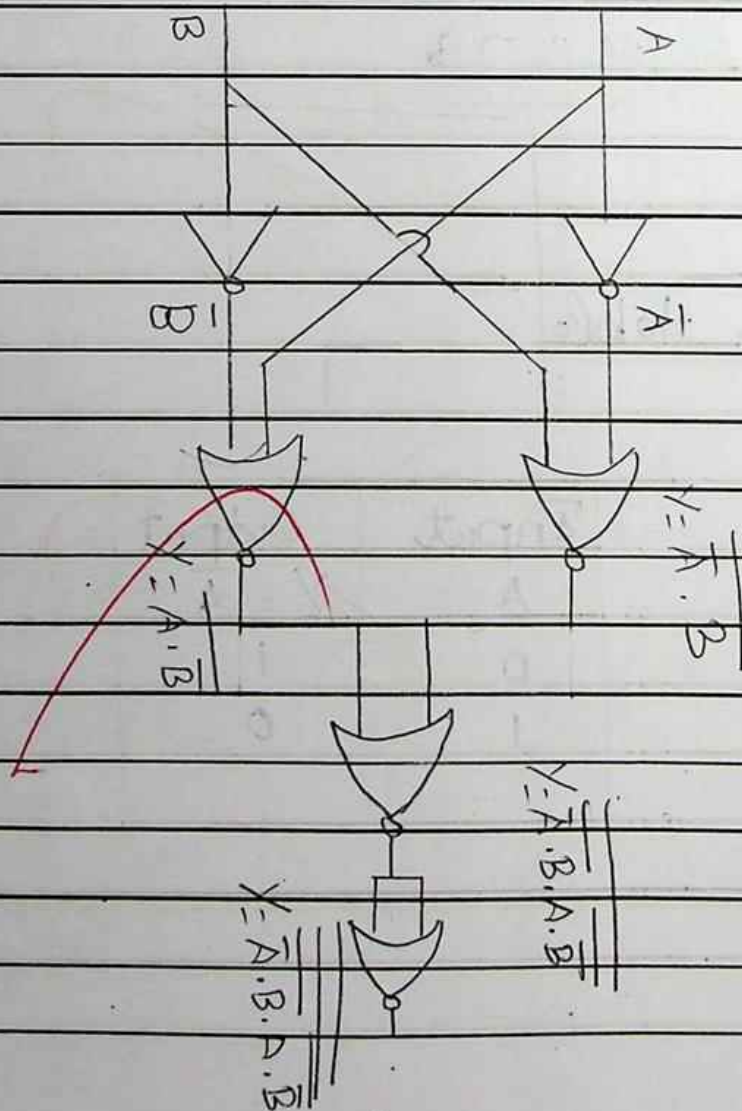
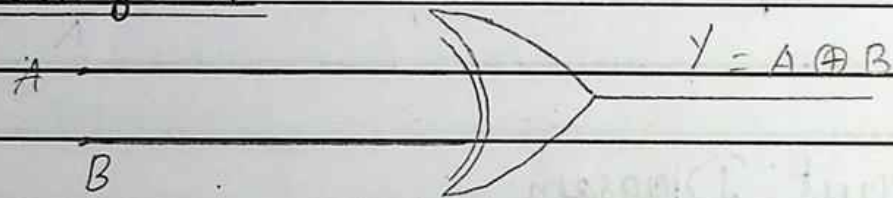
Input	Output
A	$Y = \bar{A}$
0	1
1	0



1. d) Ex-OR and AND gate Using NOR gate

i) Ex-OR gate

Logic diagram





* The logic diagram of Ex-OR gate by using NOR gate.

* It is the exclusive of OR gate.

* The output of Ex-OR gate is $A \oplus B$.

$$Y = \overline{\overline{A} \cdot B + A \cdot \overline{B}}$$

$$Y = A \oplus B$$

ii) AND gate

* The logic diagram of AND gate by using NOR gate.

* The operation of AND gate is multiplication

* The output of AND gate is $A \cdot B$.



Circuit diagram

A

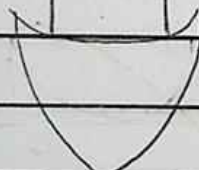
B



$$Y = A \cdot B$$

A

B



$\overline{A \cdot B}$



$Y = \overline{\overline{A \cdot B}}$

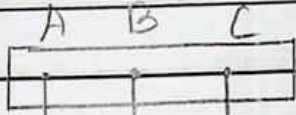
$Y = A \cdot B$

$$Y = \overline{\overline{A \cdot B}} = A \cdot B$$



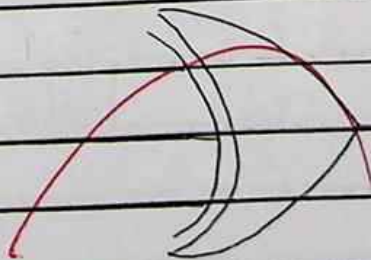
2. b) Full adder with its circuit diagram

Logic diagram



$$\text{Carry} = AB + BC + CA$$

$$\text{Sum} = A \oplus B$$





Truth table

Inputs			Outputs	
A	B	C	Sum	Carry
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

Sum

	$\overline{B}\overline{C}$	$\overline{B}C$	$B\overline{C}$	BC
$\overline{A}$	0 ₀	1 ₁	0 ₃	1 ₂
A	1 ₄	0 ₅	1 ₇	0 ₆

$$S = \overline{A}\overline{B}C + \overline{A}B\overline{C} + A\overline{B}\overline{C} + ABC$$

$$= \overline{A}(\overline{B}C + B\overline{C}) + A(\overline{B}\overline{C} + BC)$$

$$= \overline{A}(BC \oplus B\overline{C}) + A(\overline{B}\overline{C} \oplus BC)$$

$$\text{Sum} = A \oplus B \oplus C$$



Carry

	$\bar{B}\bar{C}$	$\bar{B}C$	BC	$B\bar{C}$
$\bar{A}$	0 ₀	0 ₁	1 ₃	0 ₂
A	0 ₄	1 ₅	0 ₇	1 ₆

$$\begin{aligned}\text{Carry} &= \bar{A}BC + A\bar{B}C + A\bar{B}\bar{C} + A\bar{B}C + ABC \\ &\quad + ABC \\ &= (\bar{A}+A)BC + AC(\bar{B}+B) + AB(\bar{C}+C) \\ &= BC + AC + AB\end{aligned}$$

$$\text{Carry} = AB + BC + AC$$

* The logic circuit which is used to add three bit binary numbers is called full adder.

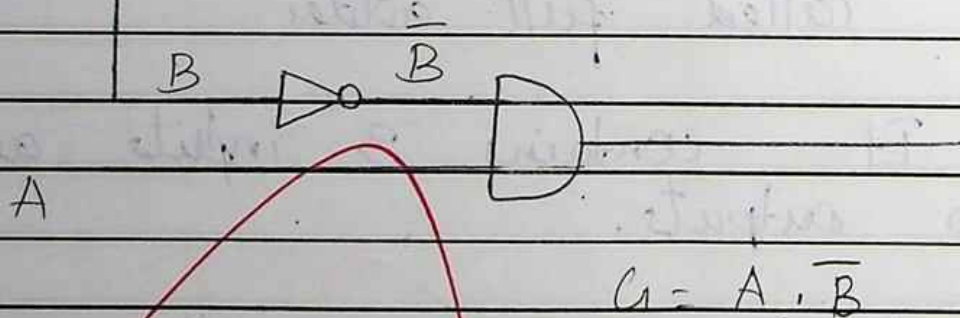
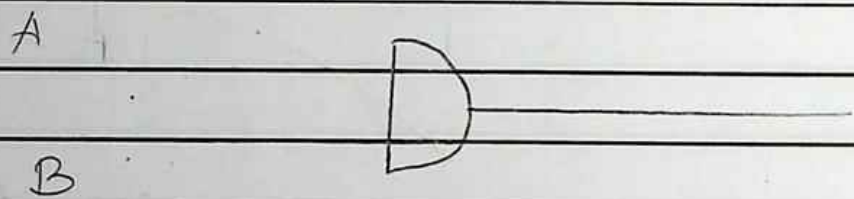
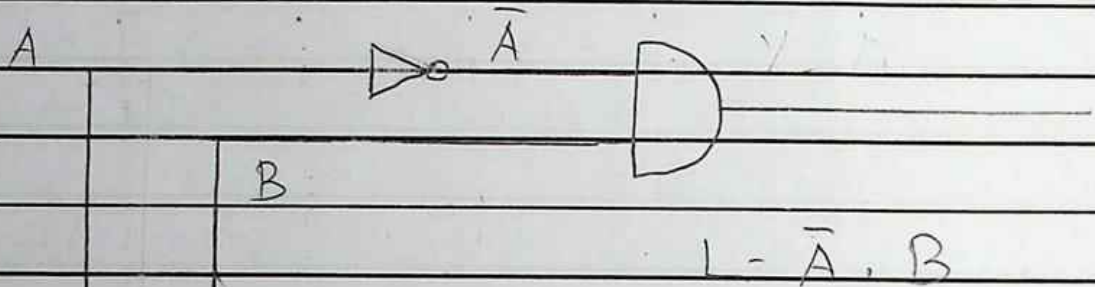
* It contains 3 inputs and two outputs.

* Here A, B, C are the inputs

* Sum and carry are the outputs.



2. d) Digital comparator



* The system of comparing the inputs and determination is called digital comparator.



Truth Table

Inputs		Outputs		
A	B	$A < B$	$A = B$	$A > B$
0	0	0	1	0
0	1	1	0	0
1	0	0	0	1
1	1	0	1	0

* The inputs $AB = 00$, the output is $A = B$, because the value of A and B is equal.

$$Y = A = B$$

* The inputs $AB = 01$, the output is $A < B$, because the value of B is greater than A.

$$Y = A < B$$

* The inputs $AB = 10$, the output is $A > B$, because the value of A



is greater than B.

$$Y = A > B$$

$$A = B = 0$$

$$E = A \cdot B$$

$$A = B = 1$$

$$E = A \cdot B$$

$$A = 0, B = 1$$

$$1 = \bar{A} \cdot B$$

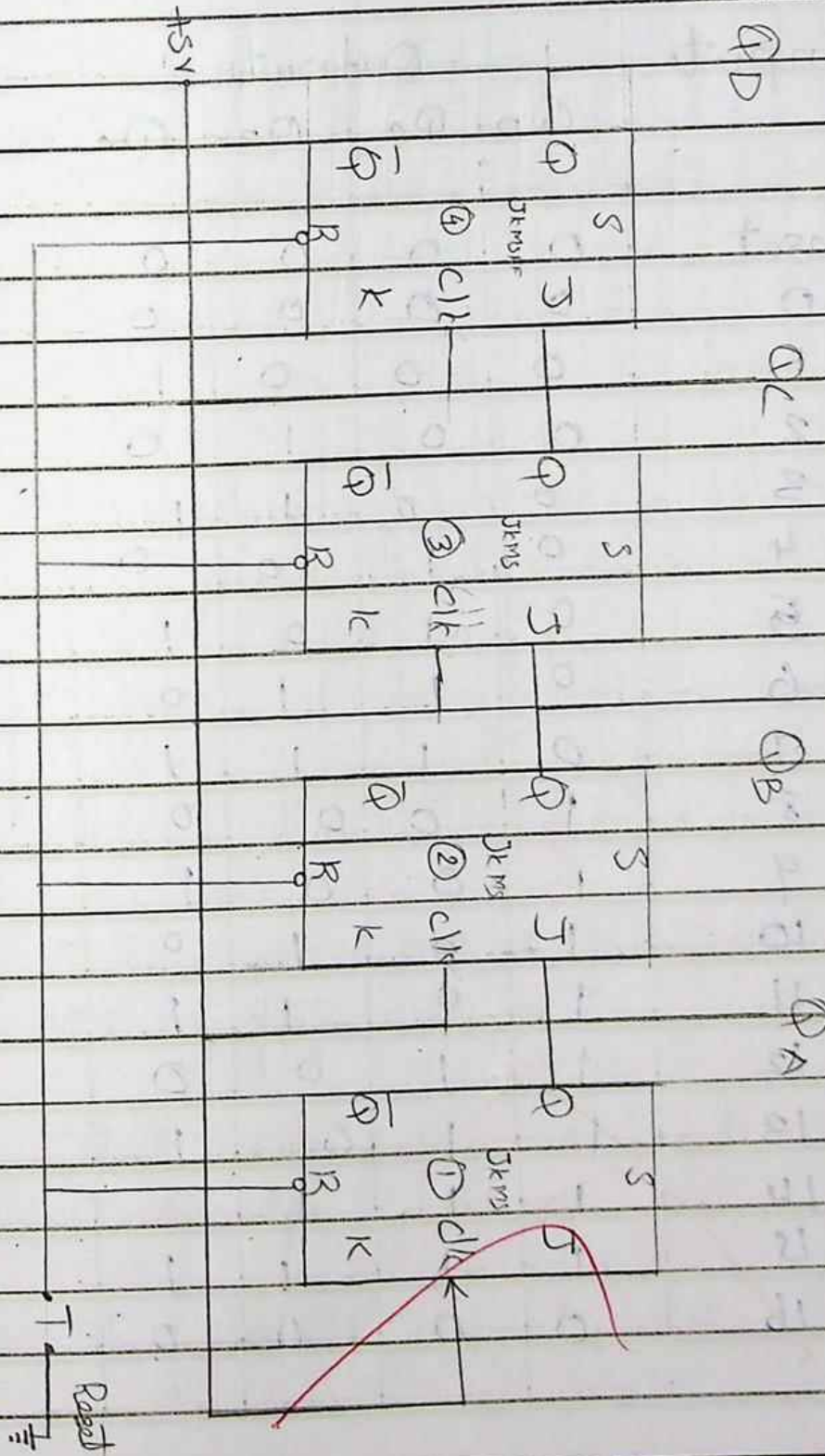
$$A = 1, B = 0$$

$$L = A \cdot \bar{B}$$

* The digital comparator is used to compare the inputs and give the compared output.



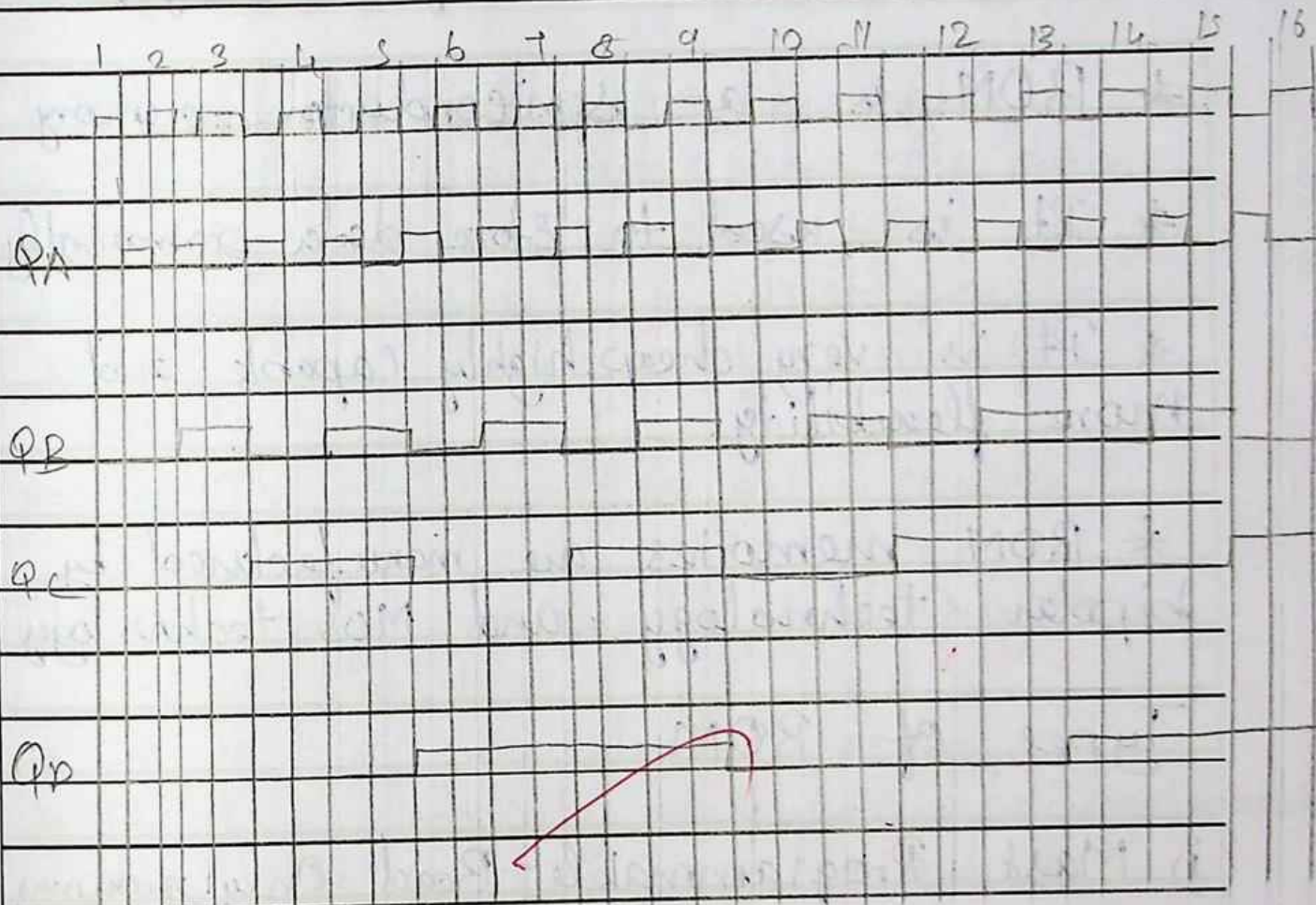
3. c) Asynchronous up counter.





Truth table

	Inputs	Outputs			
		Q _D	Q _C	Q _B	Q _A
	Reset	0	0	0	0
	0	0	0	0	0
	1	0	0	0	1
	2	0	0	1	0
	3	0	0	1	1
	4	0	1	0	0
	5	0	1	0	1
	6	0	1	1	0
	7	0	1	1	1
	8	1	0	0	0
	9	1	0	0	1
	10	1	0	1	0
	11	1	0	1	1
	12	1	1	0	0
	13	1	1	0	1
	14	1	1	1	
	15	1	1	1	1
	16	0	0	0	0



* This counter formed by using JK MS flip flop.

* The required output is $Q_D Q_C Q_B Q_A = 1111$.

* The next output will be reset.



5. a) ROM (Read Only Memory)

- * ROM is a semiconductor memory.
- * It is used to store data permanently.
- * It is very cheap, highly capable and more flexibility.
- * ROM memories are manufactured by bipolar technology and MOS technology.

Types of ROM

i) Mask Programmable Read Only memory

- * The data pattern must be programmed during the fabrication time.
- * Data pattern can never be reprogrammed.
- * It is outdated.
- * It is longer in use.



ii) Programmable Read Only Memory

- * It is electrically programmable.
- * After the fabrication time, the data are programmed by the user.
- * Reprogramming is not possible.
- * Only one time programmable.

⇒ Ex: TV, Mobile video game console.

iii) Electrically programmable Read Only Memory

- * It is a non-volatile memory.
- * It is electrically erasable and reprogrammable.
- * The ultra violet rays are used to erasing.
- * The ultra violet rays are pass through the quartz window to the chip package.
- * The complete erasing takes 20 to 30 minutes to exposing the ultra violet rays.
- * It will holds its data indefinitely.

⇒ Ex: Modem, Computer BIOS, video chip card.



Electrically

iv) Erasable programmable Read Only memory

* The main advantage of EPROM is it can erase and reprogram individual words in the memory.

* The erasing is done by power voltages.

* The erasing is done with small negligence of 100 milliseconds.

* Microcontroller for ^{smart} cards.

⇒ Ex: ATM card, debit card, credit card.

v) Flash ROM

* Information is stored in individual blocks.

* These ROM have floating gate transistors.

* Data can be read and write in blocks.

* These can perform reading, writing and erasing tasks.

* It depends on voltage supplies.

⇒ Ex: Pen drive, memory card.



5. b) Operation of Pen drive and Solid state hard disk.

Operation of Pendrive.

* Pen drive is a easily portable device.

* It is used to store data.

* It is protected with rubber or plastic case.

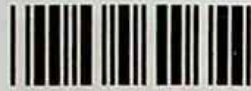
* It is better than C.D.s.

* It is very cheap.

* It has more capability.

* It is high flexible is travelling time.

* We can transfer data from one place to another by hand.



* It has our favourite settings like copy, paste, cut and delete.

* It can store files like photos, videos and documents.

* Pen drives are used for instead of CDs.

Solid state hard disk's operations.

* Solid state hard disks are new generation of storing device.

* It is used in computers.

* It is better than HDD.

* Because, it has more capacity than HDD.

* It is used to store data permanently.



* It is very cheap than HDD's

* It has sixteen bits word length in CPU.

* The memory location is fastly accessed in the SSD cards.

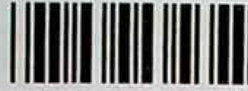
* It is used for maximum usage of storage.

* Memory processing and storing is intensily used in it.

* Encoding and Retrieval of memory is accessed fastly in the SSD's.

* It is a non-volatile memory.

~~* Using SSD disks in computer is protection from the server.~~

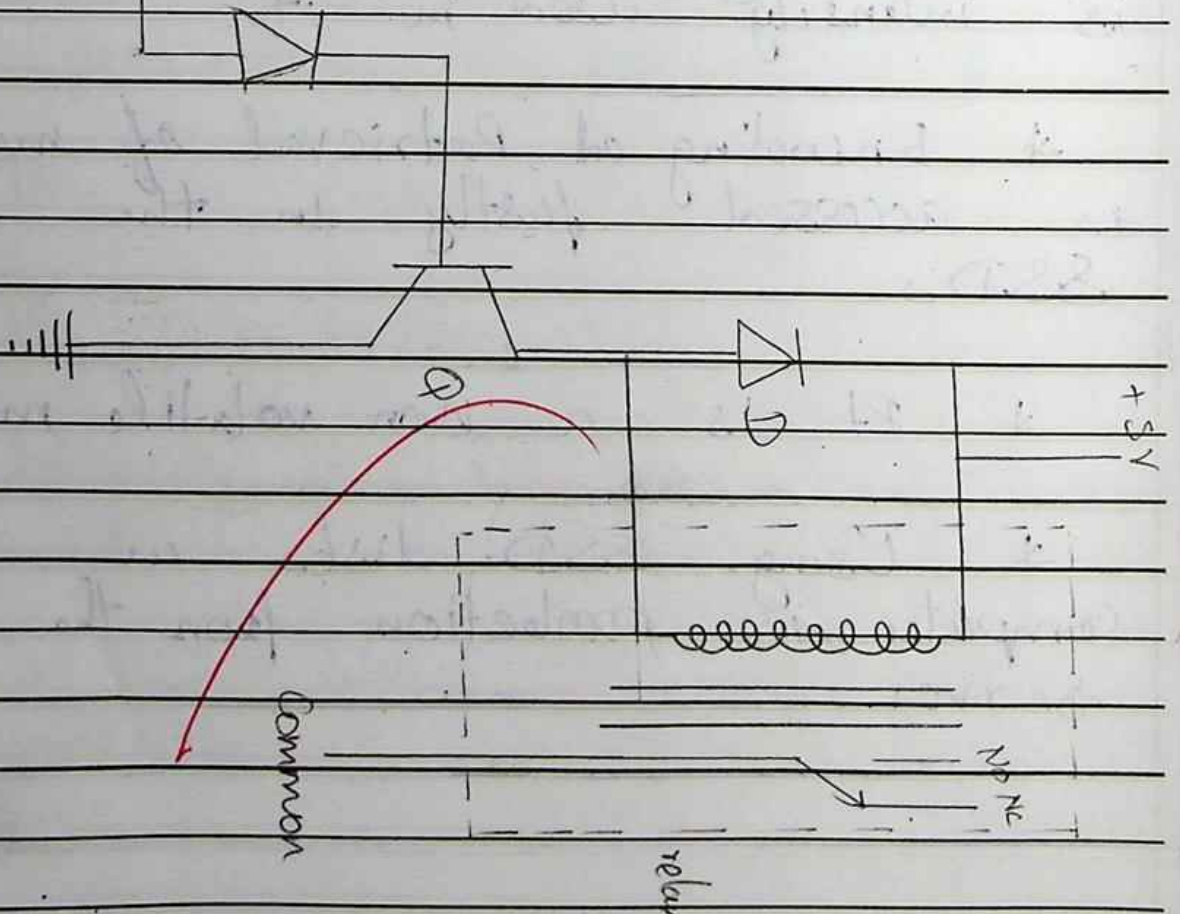


4. d) Relay and Motor interfacing

Relay interfacing.

Digital system

Output





* Relay is electrically controllable device.

* It is used in industries, automobiles and appliances.

* It has three components coil, spring and contact.

* When the current flows through the circuit, a magnetic field is created around the coil.

* It isolates magnetically from low power circuit to high power circuit.

* It causes armature to be attached to the coil.

* The armature acts like switches and close its NO and open its NC.

Motor interfacing

* In DC motor converts electrical energy into mechanical energy.

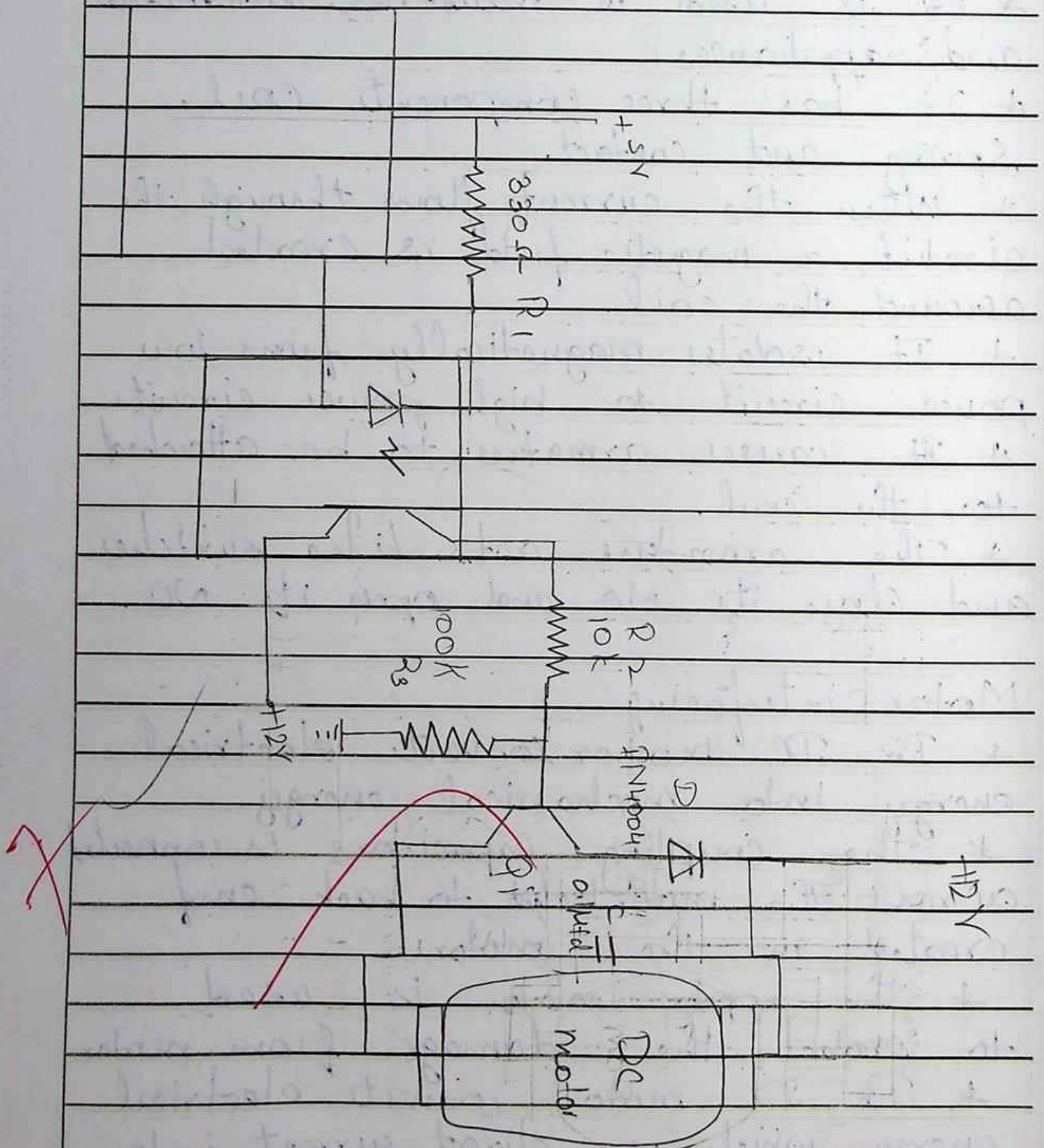
* The coupling capacitors is connected across the motor helps to back emf created in the motor.

* The opto isolator is used to protect the damage from motor

* In DC motor converts electrical energy which is direct current into



mechanical energy.





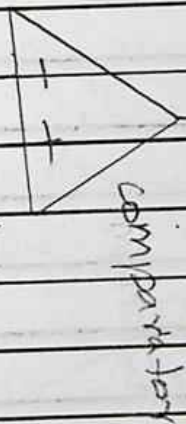
4. b) A/D converter

Analog input
(V_a)

Pulse
generator

Control logic
circuit

control
signal



Reference
voltage
(V_r)

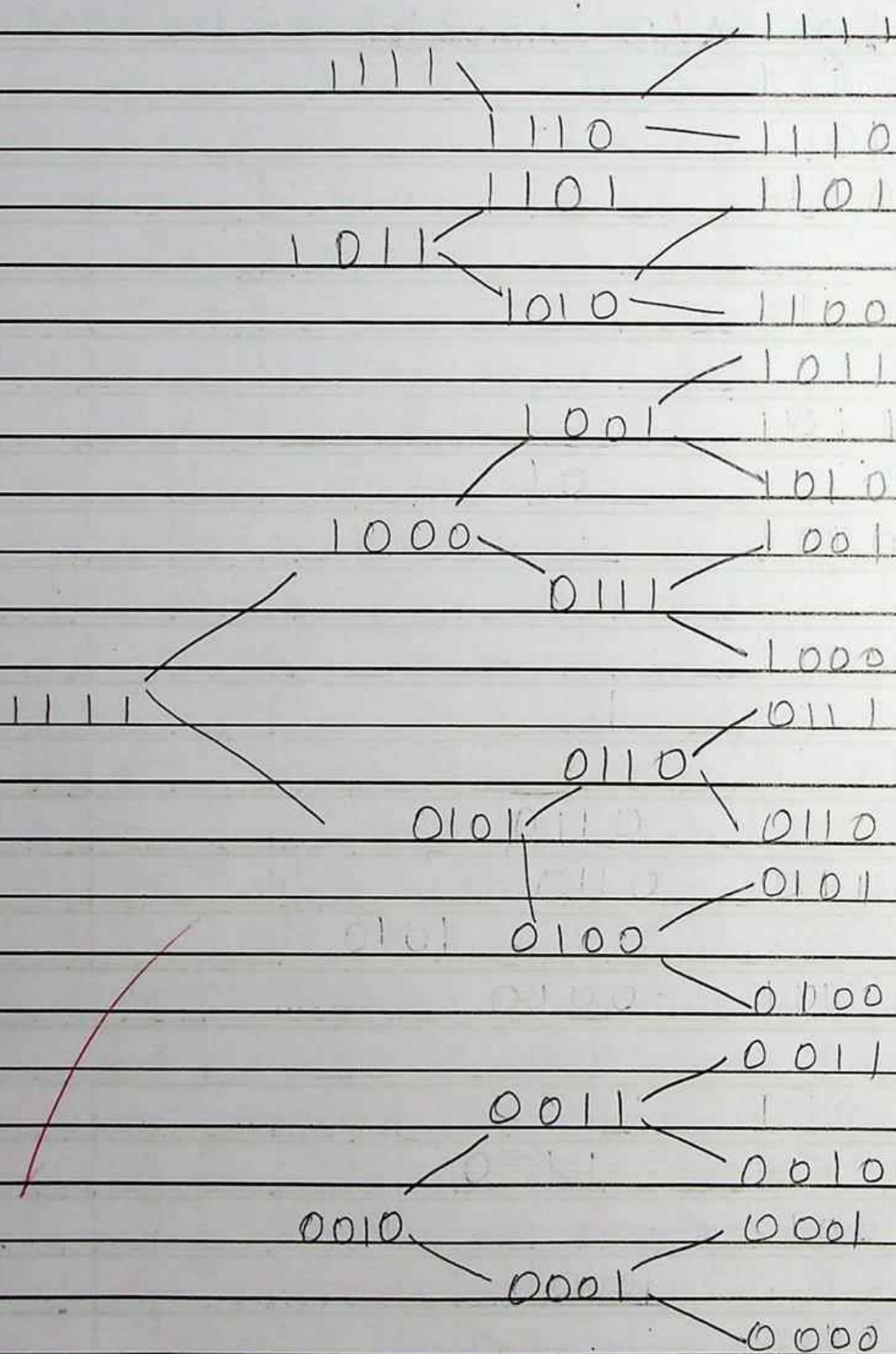
D/A converter

Successive
approximative
Register
(SAR)

MSB

LSB

MSB
0100
010
01
LSB





* The digital circuit which convert analog input into digital output is called Analog to digital converter.

* It is more complicated than D/A converter.

* It contains analog input, D/A converter, SAR (Successive Approximation Register), control logic circuit, clock pulse and a comparator.

* The output of the D/A converter is called reference voltage.

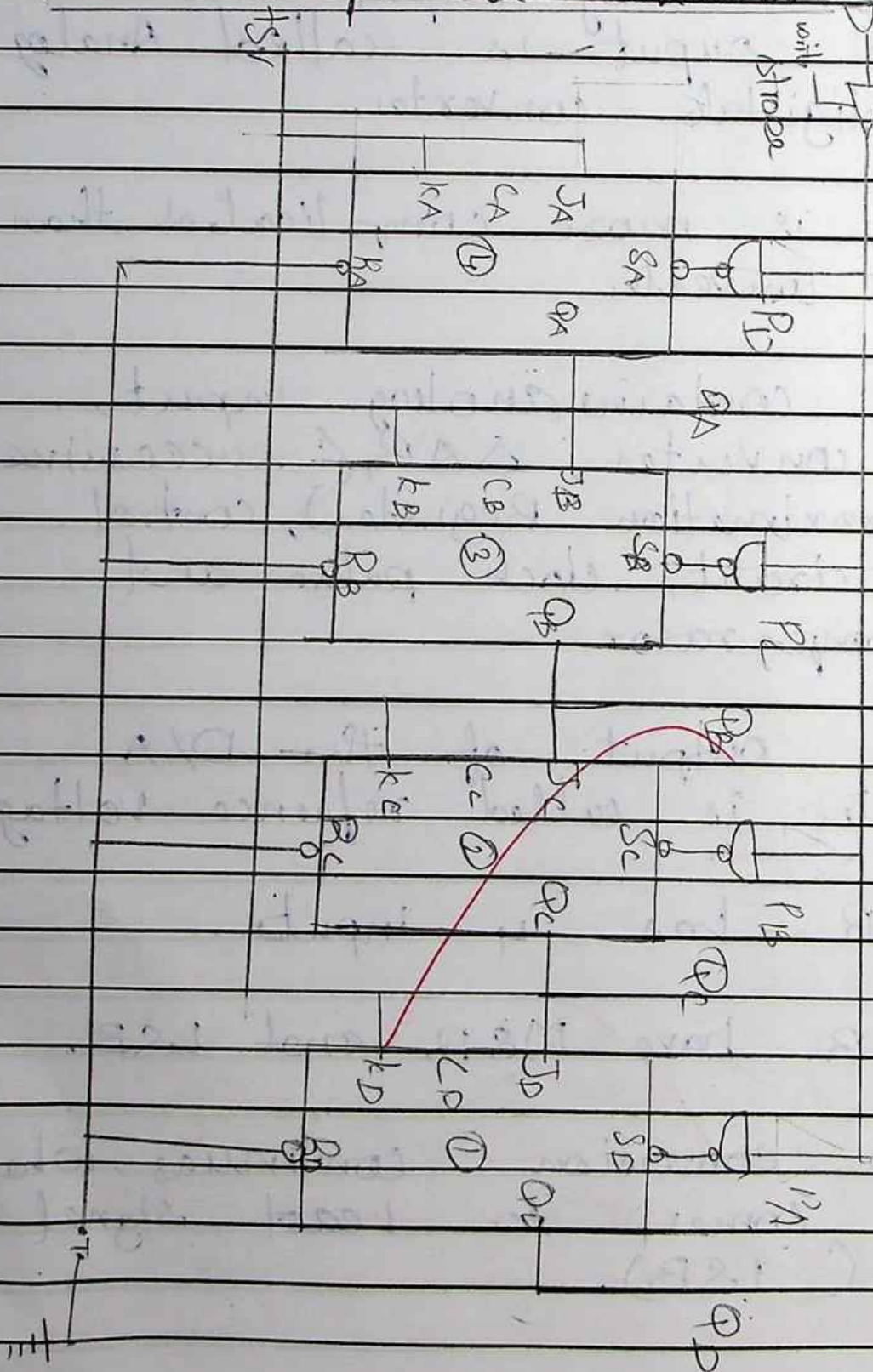
* SAR has 4 inputs.

* SAR have MSB and LSB.

* The conversion continues when it is comes to Least signal bit (LSB).



3. b) Parallel to serial and serial to parallel converter.





* Parallel to serial converting by using JKMS flip flop.

* Serial to parallel converting by using JKMS flip flop.

* Parallel to serial converting is used for write strobe signal.

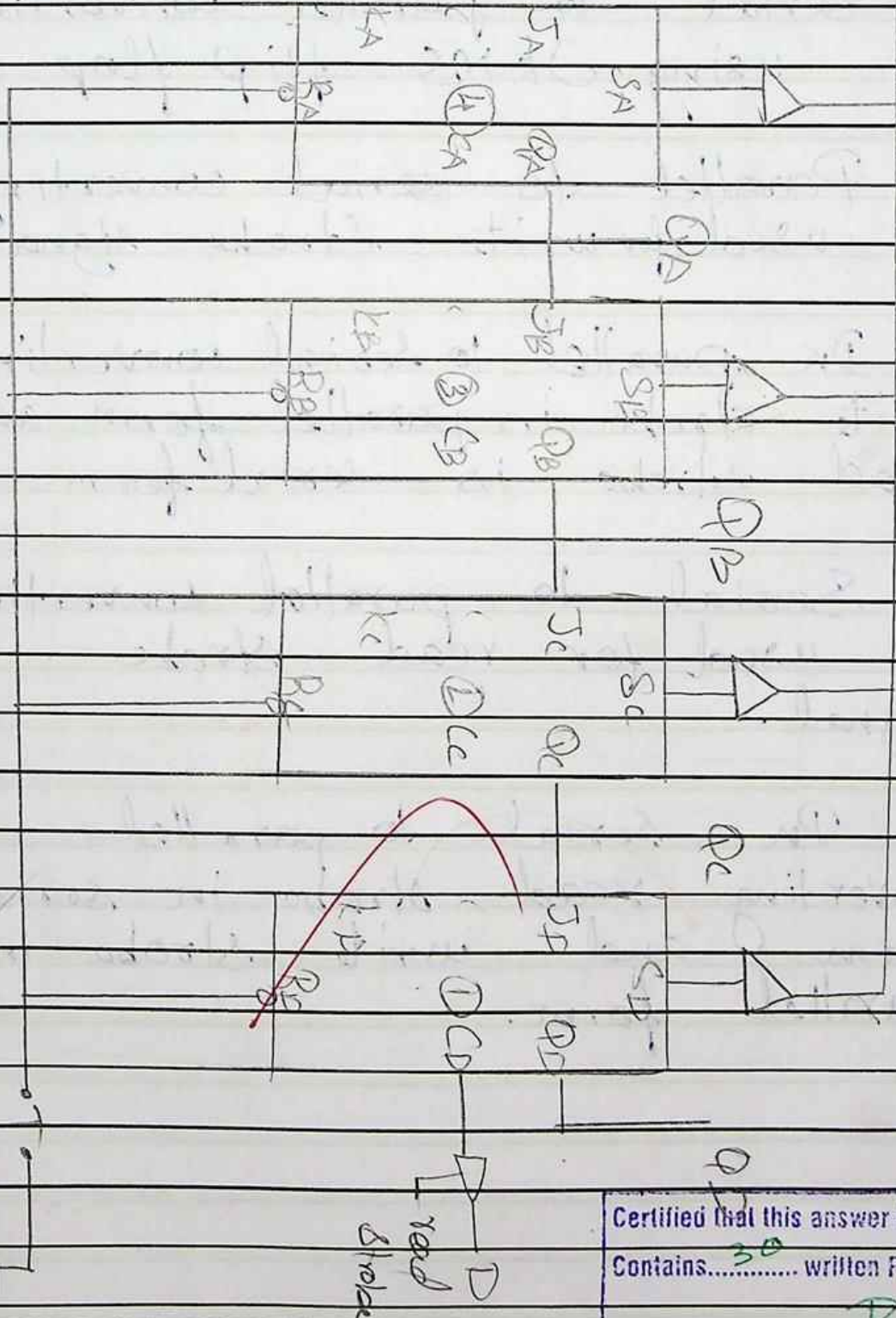
* In parallel to serial converting write strobe in parallel form and read strobe is serial form.

* Serial to parallel converting is used for read strobe signal.

* In ~~Serial~~ to parallel converting read strobe in serial form and write strobe in parallel form.



Serial to parallel converter



Certified that this answer book

Contains..... 30 written Pages

Chief Co-ordinator