DATE :__/__/__
PAGE :_____

Diode

↳ allow electric current to pass through them in one direction only
↳ low resistance in one direction & high in other
eg gum diode, LED, crystal diode

used in modulation, power conversion etc

LED light emitting diode

↳ lights up when electricity passes through it
↳ low power consumption
↳ long lifetime,
↳ small size

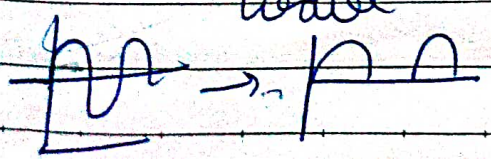
Switch

↳ electrical components that can make or break an electrical circuit
↳ used to stop or start the flow of electricity in circuit / device
eg relay, analogue switch

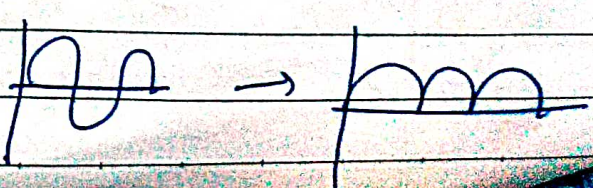
Rectifier

↳ convert AC to DC
↳ used as components of power supply

Half wave



Full wave



DATE : __/__/__
PAGE :

Convert +ve half cycle of input to DC	Convert both half cycle of AC to DC

IC (Integrated circuit)

Set of electronic circuit on one small flat piece of semiconductor material, normally silicon
→ smaller, cheaper, faster, reliable
computer, mobile

BJT (Bipolar junction transistor)

3 terminal device
that acts as amplifier or switch

3 terminal
- Emitter
- Base
- Collector

2 types

NPN	PNP
Emitter is made of N-type material	Emitter is made of P-type material
C → E	E → C

DATE : __/__/__
PAGE : _____

Configurations

- Common Base → E → C
- Common Collector → B → E
- Common Emitter → B → C

3 regions of operation

Active region	Cut-off region	Saturation
$V_C > V_B > V_E$	V	BE/BC FB
current starts to flow	BE/BC RB	

Base

B-E FB — Forward Bias — used for amplification

BC RB — used for switching

DATE :__/__/__
PAGE :

* AM (Amplitude Mod.) | FM (Frequency Mod.)

→ Type of modulation where amplitude of carrier signal is varied in accordance to input signal | " frequency "

* Op-amp (Operational amplifier)

→ DC coupled high gain voltage amplifier

Energy meters

→ used to measure energy
→ energy is amount of power consumed over a period of time

$$E = \int P\,dt$$

Energy → Watt-hour
∴ also klas Watt hour meters
→ used to measure electrical energy of devices
→ homes, industries etc

Types

Single phase
→ used for home
→ directly connected blue line & load

Three phase
→ Commercial, industrial
→ Step down transformers are used to isolate energy meter

$P = V \times I$

DATE : __/__/__
PAGE :

Two types of display

Analog Digital

Types of metering point

Secondary Primary

Type of application

domestic commercial industrial

* Electro mechanical Induction type Energy meter

→ Conventional type of EM.

→ Rotating aluminium disc mounted on a spindle b/w 2 electromagnets

Speed of rotation α Power

→ Power is integrated for a period of time to get energy

2 types of magnet

↙ Series ↘ Shunt

DATE : __/__/__
PAGE :

↳ connected series

Series magnet carries a coil → few turns
Shunt magnet carries a coil → many no. of turns
↳ connected to // to line

Break magnet → applies force opposite to disc to bring disc back to its balanced position

Current flowing in magnet produces a magnetic field which leads to emf generation which rotates the Al-disc, the speed of disc is noted by pointer on a scale (readings ↓ lower)

We integrate this power for a period of time, energy is calculated

→ domestic & industrial application

Electronic Energy meter

→ More accurate, high precision, reliable, consumes less power
→ starts measuring instantaneously connected to load

- Analog
  - do not measure power directly, convert power to frequency and then calculates
- Digital
  - direct digital output of power is given

* Most energy meter are used for AC current

DATE : __/__/__
PAGE : _____

Smart energy meter

→ replaces intelligent meter, to read, process, and feedback the data to customers

→ measures energy remotely
→ can be used for long distance

PCB (Printed Circuit Board)

Steps

① Designing PCB layout → using any PCB software like Easy EDA, Eagle etc.
Routes are made of Copper to connect various components.

② Printing PCB
↳ PCB is printed on a sheet of photosensitive material klas photo resist

③ Etching
↳ PCB is covered photoresist sheet is exposed to UV light through a mask
In this the unhardened areas are removed, leaving Cu traces

④ Copper plating (Optional) → to enhance conductivity, durability

⑤ Drilling → at specific location to mount components

⑥ Soldering → soldering is applied covering all areas except copper traces, to provide insulation & protection

⑦ Electrical testing

⑧ Routing & seperation from large panel

⑨ Final inspection

Relays

→ electrically operated switch
→ usually used for circuit having low power signal

2 parts of components

Primary
- Records the control signal to operate relay
- eg. Switch, Battery

Secondary
- connected to load which is being controlled
- eg for light

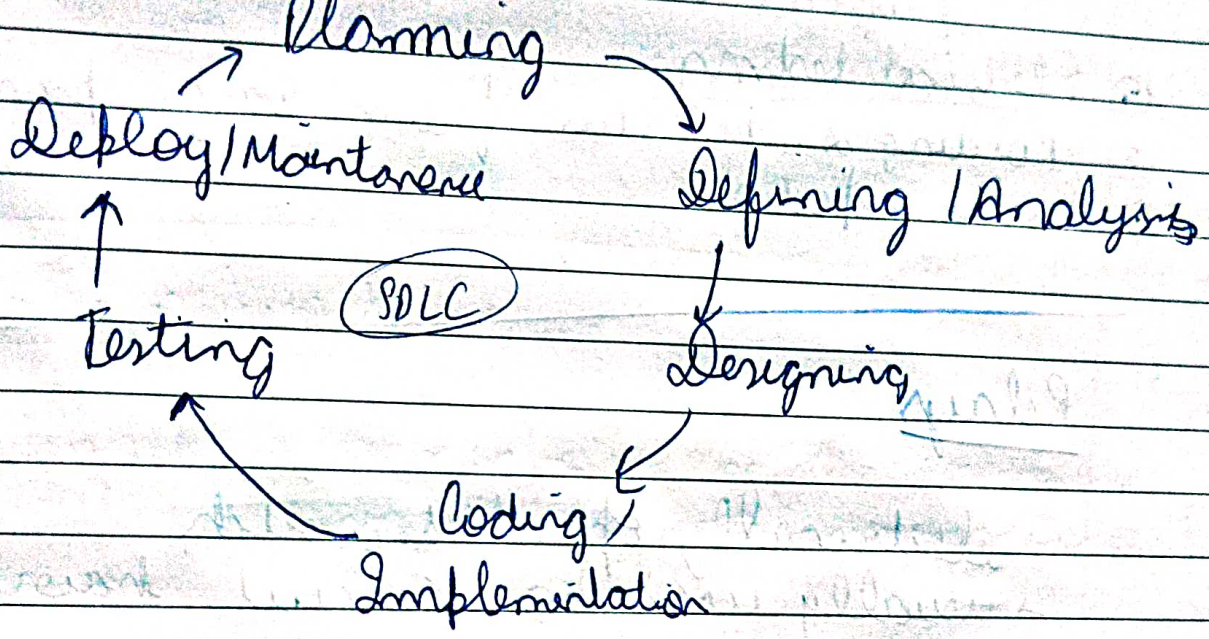
→ Electromagnetic coil when emf is produced circuit is completed.

PAGE :

SDLC

Software Development life cycle :

Different A systematic or cyclic way to develop a software



* Waterfall Model (Old model) (Small projects)

→ Follows a linear and sequential approach where each phase must be completed before moving to next one

Requirement gathering ↓
System Design ↓
Coding / Implement
↓
Testing
↓
Deploy
↓
Maintenance

Disadvantage

↳ No feedback
↳ No experiment
↳ High risk
↳ Less flexible

DATE : __/__/__
PAGE :

* V shaped model
  ↳ also kha verification & validation model
  ↳ testing is done after every phase

* Agile model (Newest model, used in major projects)

Agile means move quickly

Large projects
↓
breaks into
small iterations
called sprints
which are developed
↓
then Released
↓
Get feedback
↓
Enhance the model
↓
Re-Release

→ Feedback
→ Frequent delivery
→ Quick
→ Reliable
→ less risk
↳ More flexible

Disadvantage
→ Maintenance problem
→ Documentation problem

DATE :__/__/__
PAGE :_____

Why does transformer not work on DC

Because in AC the flux of coil changes w.r.t. time as there is no polarity in magnetic field produced by AC, this flux changes produces an emf. which leads to voltage production
But in DC, no flux is changed as magnetic field is constant in DC

Computer network

→ Network → connection of computer, hardware connected by some communication channel (wired/wireless)

Type of architecture

P2P
(Peer to peer)

→ In which all computers (nodes) have equal status

Client-server

→ In which certain computers have specific dedicated task like provi service to other com

Server → which provides s
Client → use the servic

DATE :__/__/__
PAGE :

* Modem (Modulator Demodulator)

Device used for conversion b/w analog signals & digital bits

Analog → Modem → Digital → Computer

* NIC (Network Interface card)

Ethernet card → network adaptor used to setup a wired connection. It acts as an interface b/w computer & network.

* Repeater

↳ Signals lose their strength for long distance or beyond limit. In such condition repeaters are used to regenerate the signal

* HUB

↳ To connect different devices through wire.

* Switch → Plays a central role in LAN
→ Connects multiple computer
→ Switch extracts the destination address of data and look up in table where to send the data

* Router → Receives data, analyse it & transmit to other networks
→ Connects LAN to internet
→ Sends data to any network type

DATE : __/__/__
PAGE : _____

Gateway

↳ network type must be same, acts same as router

OSI model

Open system Interchange model
→ developed by ISO

→ 7 layer architecture where each layer have specific functionality
→ All these 7 layers work collaboratively to transmit data from one network to another

Sender → Application —— Receiver
Presentation —— } Software layer
Session ——
Transport —— } Heart of layers
Network —— } Hardware layer
Data link ——
Physical ——

DATE : __/__/__
PAGE :

Physical
↳ Transmitting of raw data over channel
↳ Connections, Topology, Error correction, Type of connector used

Data link
↳ transforms raw data into data frames and transmit frame sequentially
↳ Traffic regulation is done

Network layer
→ determine how packets are routed from source to destination
↳ congestion control is done
↳ packet addressing done for reliable transmission

Transport
→ Connects hardware layer to software layer
→ recv data from above layer and ~~sends~~ do splits it and sends to network layer
↳ ensures all messages are recieved

Session layer
→ Dialog control, token management, synchronize

Presentation
→ Data representation, schematics & syntax of info to be transferred

DATE : __/__/__
PAGE : _____

Application

→ contains variety of protocols used by users
eg- web, http, smtp, dns
→ to access www

× Bad timing, Bad technology

TCP/IP

Application	HTTP	SMTP	RTP	DNS
Transport	TCP	UDP		
Internet	IP	ICMP		
Link	PSL	SONET	802.11	

protocols

✱ Switched Networks

Switching in computer network helps in deciding the least route for data transmission if there are multiple paths in a large network

- Circuit switching
- Message switching
- Packet switching
  - → Datagram
  - → Virtual

Circuit switching

→ There is a dedicated path between sender & receiver
→ Path is established for entire conversation
eg Telephone

Steps -
→ Connection establish
→ Data transfer
→ Connection disconnection

Message switching

→ Store & forward mechanism
→ Big message is broken into small messages and all messages are stored at each intermediate node and forwarded.

Packet switching
eg Internet
→ Message is broken into small pieces called packet
→ Each packet is sent individually
→ Each packet will have source & destination address and various no.

Datagram
→ Connectionless
→ Path is not fixed
→ Intermediate node take routing decision

Virtual
→ Connection oriented
→ Logical circuit is established before transmission
→ Path is fixed

DATE : __/__/__
PAGE :

* Anonymus FTP → way of allowing a user to access data that is public
  → user has to log in as anonymus
* UTP cable → 100R cable made of copper
  → Consist of 2 - Unshielded twisted pair cable (100m)
* HTTP → hyper text transfer protocol
  ↳ allows communication over internet
  ↳ it defines how messages are transmitted over www
  ↳ connection less
* UDP → User datagram protocol
  ↳ used to create a low latency communication
  ↳ communicates via datagram.

TCP	UDP
→ Connection mode before message exchange	→ Connection mode after messages sent
→ More reliable, less speed → ACK is received → Order of message is important	→ more speed, less reliable ↳ ACK is not received → Order of messages not sure

IEEE → Institute of electrical & electronics engineer

DATE : __/__/__
PAGE :

DOS → Denial of service

↳ Attack that prevent a legit user from accessing data by a hacker
↳ overloads the server

* MAC address (Media Access control)
↳ computer is unique number
↳ 48-bit number
↳ identifies each device on a network
↳ also called physical address

* DNS - Domain name system
↳ hierarchical & decentralized
↳ translates domain names to numerical IP address which is used to identify devices

IPV6 → Version-6, latest version of IP
→ 128 bits
→ resolves issue of approaching shortage of network addresses

DATE :__/__/__
PAGE :

MOSFET

Metal oxide Semiconductor field effect transistor

3 terminal device → source, gate, drain

at gate terminal voltage is applied, which creates a channel for conduction b/w drain & source terminal

Conduction happens by majority charge carriers

Compared to BJT it occupies less space

3 modes

Accumulation	Depletion	Inversion mode
→ $V_g < 0$	→ $V_g \geq 0$	$V_g >> 0$
→ no channel formed	→ channel starts to form	→ channel is formed

Threshold volt

↳ voltage which needs to be overcome so that the conduction of channel can start

DATE : __/__/__
PAGE : _____

Operating System (OS)

→ software that acts as an interface between computer hardware & user application
eg android, iOS, linux, windows

Program → Set of instructions written in a programming language that ~~or~~ of perform a specific task
→ stored in a file

Process → Instance of a program in execution, when a program is loaded into memory, it becomes a process