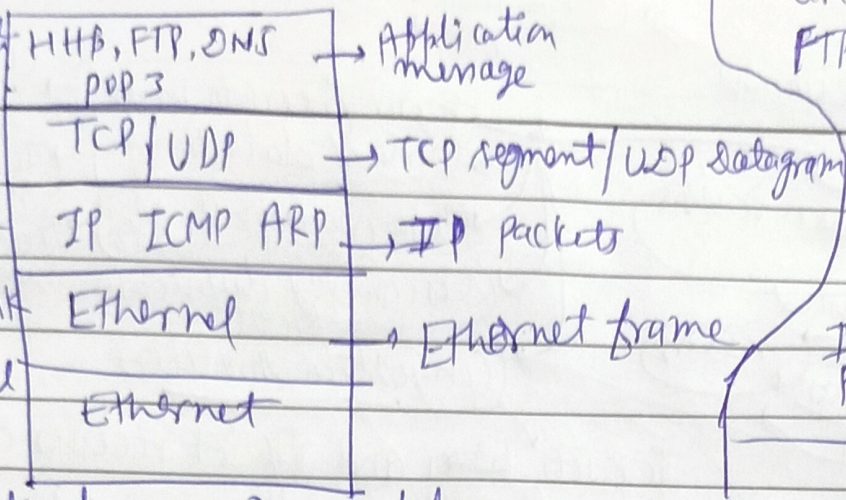
TCP/IP Model

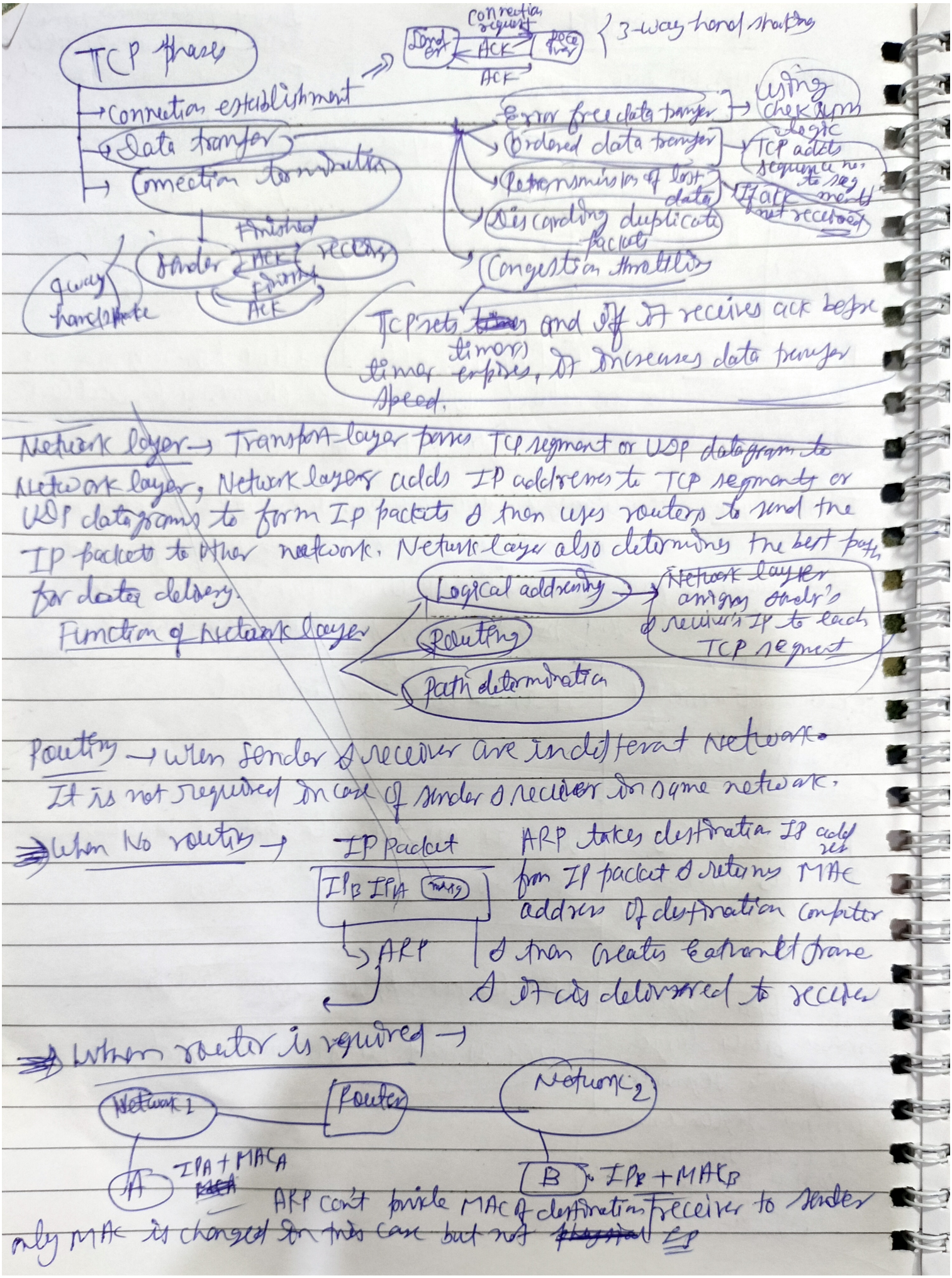


~~DNS~~ → ~~IP~~ ↔ ~~Domain Name~~
DHCP → Auto assign IP address
FTP → File transfer protocol
HTTP → send & receive web pages
IMAP & SMTP → E-mail messages
IRC → Internet chat
POP3 → Retrieve msg from remote server

Application layer → is used by user applications that pass msg from one computer to another in network. User apps like Chrome, Firefox, Outlook
Protocols used in Application layer:- HTTP/HTTPS, SMTP, DNS

Transport layer → Receives msg from application layer. TCP or UDP is selected. TCP supports segmentation. If msg is large, TCP divides it into smaller pieces & adds header to form TCP segment, UDP does not support segmentation. So application should sent ~~packet~~ short msg so that it fits in one UDP datagram

TCP	UDP
It is connection oriented means need to create connection b/w server & client.	It is ~~con~~ Connectionless protocol.
TCP is reliable & it checks error & resends the damaged frames	UDP is not reliable protocol because it does not do error checking
TCP supports segmentation means breaks large msg into segments & assigns sequence no. to each segments so that they can retrieved properly.	UDP does not support segmentation. UDP is used for streaming videos


TCP phase
connection establishment
data transfer
connection termination
connection request
SYN
ACK
ACK
3-way handshaking
Error free data transfer
using checksum
Ordered data transfer
TCP adds sequence no. to segments
Retransmission of lost data
If ack not received
Discarding duplicate packets
Congestion control
Finished
FIN
ACK
FIN
ACK
TCP sets timers and if it receives ack before timer expires, it increases data transfer speed.
Network layer → Transport layer forms TCP segment or UDP datagram to Network layer, Network layer adds IP addresses to TCP segments or UDP datagrams to form IP packets & then uses routers to send the IP packets to other network. Network layer also determines the best path for data delivery.
Function of network layer
Logical addressing
Routing
path determination
Network layer assigns sender's & receiver's IP to each TCP segment
Routing → When sender & receiver are in different network. It is not required in case of sender & receiver in same network.
When No routing →
IP Packet
IP_B IP_A msg
ARP
ARP takes destination IP address from IP packet & returns MAC address of destination computer & then creates ethernet frame & it is delivered to receiver
When router is required →
Network 1
Router
Network 2
A
IP_A + MAC_A
B
IP_B + MAC_B
ARP can't provide MAC of destination receiver to sender only MAC is changed for this case but not IP

Data link layer → The data unit in data link layer is called as Ethernet frame.

DLL
1. Medium Access control (MAC) — Access MAC of sender / receiver → Data encapsulation
2. Logical link control (LLC) → Accessing media → Flow control, Error control

→ MAC layer adds header & trailer to IP packet received from network layer

MAC of receiver & sender	IP header	error checking data

→ Accessing media use method CSMA/CD (carrier sense multiple access / collision detection)

Physical layer → Actual communication b/w sender & receiver takes place. This layer converts bitstream sequence to signals & transmits from over local media

Sender 001110 → Receiver

Signal		Local media
Electrical	—	Copper cable / Lan cables
Light	—	optical fiber
Radio	—	Air / vacuum

Ethernet protocol is used at physical layer

When Router is required, sender & receiver in different network

Network 1 — Router — Network 2

A: IP_A, MAC_A

Router: IP_R, MAC_R

IP_B	IP_A	data
MAC_R	MAC_A	

Ethernet frame

IP_B	IP_A	data
MAC_B	MAC_R	

Ethernet frame

B: IP_B, MAC_B

IP_B	IP_A
MAC_B	MAC_R

MAC of router