1. Flow control regulates data flow between a sender and a specific receiver, ensuring that the receiver can handle the data at its own pace. Optimizes end-to-end data transfer.
Congestion control manages network-wide congestion to prevent resource overload, optimizing fair resource allocation among all network flows. Avoids network congestion, packet loss and degradation of connections.

2.Open/Closed Loop. Open loop uses predetermined rules for adjusting sending rates or simply being static, while Closed loop utilizes real-time feedback such as acknowledgements to adjust sending rates.
OL ; token bucket algorithm. CL ; TCP

3. Additive Increase (AI): Initially, the sender increases its congestion window (cwnd) size linearly. For each successful acknowledgment received, the sender increments its cwnd by a fixed value. This increment aims to probe the network's available capacity for efficient data transmission. The formula for additive increase is:
cwnd = cwnd + a, where a is the additive increase factor.

Multiplicative Decrease (MD): When congestion is detected, typically through packet loss or explicit congestion signals (e.g., ECN markings), the sender reacts by reducing its cwnd multiplicatively. It essentially throttles back its sending rate to alleviate network congestion. The formula for multiplicative decrease is:
cwnd = cwnd * b, where b is the multiplicative decrease factor (usually less than 1).

AIMD Iteration: The sender iteratively goes through the AIMD process, probing for network capacity and reacting to congestion. It increases cwnd additively in periods of low congestion, and reduces cwnd multiplicatively when congestion is observed.

4. "Reno" stands for "REcovery after loss" and "NO congestion." . TCP Reno employs the slow start and congestion avoidance phases, to determine an appropriate sending rate. When packet loss is detected, it triggers a fast recovery mechanism, which allows it to recover quickly and regain its fair share of network resources. This proactive approach helps TCP Reno to maintain network stability and fairness while achieving efficient data transmission.

5. TCP Tahoe's main drawback is its inability to effectively handle what is known as "global synchronization". Global synchronization occurs when multiple TCP flows sharing a common bottleneck link reduce their sending rates simultaneously in response to congestion signals, leading to suboptimal network utilization and performance.

TCP Vegas is designed to address global synchronization by introducing a mechanism to estimate the available bandwidth more accurately, estimating round-trip time variations and adapting its sending rate.

6. Tunneling is used to encapsulate and transmit data packets of one protocol within the data packets of another protocol, allowing data to traverse networks that would otherwise not support the original protocol directly.

7. First 3 Fragments have a length of 1300 Bytes, with the fragment flag set to true, with an incrementing offset of 162 bytes from 0. The 5th fragment has a length of 980 bytes, fragment flag set to false, and a final offset of 520 bytes. All Fragments have the same Unique ID.

8. IPv4 has much more options, DSCP, Total length, identification, flag, fragment offset, TTL, protocol, header checksum, while IPv6 has Priority, flow label, payload length, next header, hop limit. IPv6 also uses 128-bit addresses vs 32-bit addresses, also utilizing simplified address assignment and IPv6 multicast.

9.Routing Information Protocol ; Distance-Vector Algorithm- determines the best path for packets.
Hop Count Metric- Determines distance or cost to a destination network.
Split Horizon and Route Poisoning- Declares routes unreachable, generally beyond 16 hops, noting network failures.

10. Open Shortest Path First ;
Backbone Routers (Area Border Routers)- connects multiple OSPF areas. Perform route summarization and translate routing information between areas to reduce the amount of routing information that needs to be propagated throughout the network
Internal Routers (Intra-Area Routers)- Reside entirely within a single OSPF area. Maintain detailed routing information for their own area. Generate the Link-State Advertisements (LSAs) that describe the state of the networks and links within their area
Autonomous System Boundary Routers (ASBR)- Connect the OSPF routing domain to external networks. Redistribute external routes into OSPF by injecting these routes as Type 5 LSAs. Translate routing information between OSPF and other routing protocols.

11.

Nodes	1 b	2 c	3 d	4 e	5 f	6 g	7h	8i
0a	4	8	x	x	x	x	x	x
1b	4	8	12	x	x	x	x	x
2c		8	12	15	9	x	x	x
5f			12	15	9	x	11	x
7h			12	15		25	11	21
3d			12	14		19		21
4e				14		19		21
6g						19		21
8i								21

12. No clue what this is. Not Bellman-Ford's. Send me an email with resources for this.

Edges	A-B	A-C	B-C	B-D	B-E	D-B	D-C	E-D
Iter 1	-1	4	3	2	2	1	5	-3
Iter 2								
Iter 3								
Iter 4								
Iter 5								

Nodes	A	B	C	D	E
Iter 1	0	-1	2	inf	inf
Iter 2	0	-1	2	-2	1
Iter 3	0	-1	2	-2	1
Iter 4	0	early	stop	no	update

Iter 5	0				

13.

Nodes	2 b	3 c	4 d	5 e	6 f
1a	20	22	6	x	x
4d	20	22	6	14	31
5e	17	22		14	26
2b	17	19			26
3c		19			25
6f					25