1. Which of the following statement does *not* apply to transport-layer protocols

   A. only live in hosts

   B. responsible for encapsulating and delivering application data

   C. move messages from end systems to the network edge

   D. do not have any say about how the messages are moved in the network core

2. The transport-layer provides the end to end logical communication between two hosts.

   A. True   B. False

3. The transport layer can only provide services that are supported in the underlying network layer.

   A. True   B. False

4. Transport layer congestion control is not so much a service provided to the invoking application as it is a service for the Internet as a whole.

   A. True   B. False

5. Some applications are better suited for TCP as opposed to UDP because TCP provides finer application-level control over the data.

   A. True   B. False

6. The transport-layer services provided by UDP include

   A. congestion control, error checking

   B. process-to-process data delivery, error checking

   C. reliable data transfer, congestion control

   D. reliable data transfer, process-to-process data delivery

7. Reliable data transfer can occur at

   A. transport-layer

   B. link layer

   C. application layer

   D. all of the above

8. Reliable data transfer is realized through

   A. error detection

   B. receiver feedback

   C. retransmission

   D. all of the above

9. (1 point) Which of the following mechanism(s) address(es) packet loss?

   A. sequence number

B. retransmission

C. timer

D. all of the above

10. Neither GNB nor SR accommodates packet re-ordering

   A. True   B. False

11. Which of the following is (are) a stop-and-wait protocol (s)?

   A. Go-Back-N

   B. Selective Repeat

   C. Pipelined

   D. none of the above

12. In Selective Repeat (SR) protocol with a window size `N`, define `rcv_base` to be the sequence number equal to the base of the window. When the receiver receives a packet (p) with sequence number in `[rcv_base-N, rcv_base=1]`:

   A. p must be a retransimitted packet

   B. the receiver must generate an ACK for p

   C. the receiver must have generated an acknowledgment for p before

   D. all of the above

13. In Go-Back-N (GBN) protocol, define `N` to be the maximum allowable number of packets that can be transmitted without waiting for an acknowledgment, `base` to be the sequence number of the oldest unacknowledged packet, and `nextseqnum` to be the smallest unused sequence number. The sequence number of in-flight packets falls into:

   A. `[0,base-1]`

   B. `[base,nextseqnum-1]`

   C. `[nextseqnum,base+N-1]`

   D. `>base+N`

14. In TCP protocol, the timeout interval is solely determined by the estimated value of RTT.

   A. True   B. False

15. TCP flow control and congestion control take similar actions — the throttling of the sender.

   A. True   B. False

16. TCP fast retransmit addresses the problem of relatively long time-out period

   A. True   B. False

17. The cause of network congestion — too many sources attempting to send data at too high a rate — can be treated by

   A. error detection

   B. retransmission

   C. adjust sender's congestion window size

D. all of the above

18. In TCP, define `cwnd` to be the congestion window size, `rwnd` to be the receive window size, the amount of unacknowledged data can not exceed

A. `rwnd`   B. `cwnd`   C. `min{cwnd,rwnd}`   D. `max{cwnd,rwnd}`

19. During TCP slow start, the sender's initial rate is slow but ramps up exponentially fast.

A. True   B. False

20. The goal(s) of TCP congestion control include

A. don't congest the network

B. make use of all the available bandwidth

C. distributed: realize global objective based only on local information

D. all of the above

21. When the congestion window size is w bytes and the current round-trip time is RTT seconds, TCP's transmission rate is no more than _____

22. A TCP sender can detect a "loss event" by

A. timeout

B. duplicate ACKs

C. ACK with ECE (explicit congestion notification echo) bit

D. all of the above

23. TCP fast recovery can be triggered by

A. timeout

B. duplicate ACKs

C. new ACK

D. all of the above

24. In TCP congestion control, a timeout event will always transition a sender to the slow start state.

A. True   B. False