Chapter 3 Transport Layer

1. A transport-layer protocol provides for logical communication between ____.

A Application processes

B Hosts

C Routers

D End systems

2. Transport-layer protocols run in ____.

A Servers

B Clients

C Routers

D End systems

3. In transport layer, the send side breaks application messages into ____, passes to network layer.

A Frames

B Segments

C Data-grams

D bit streams

4. Services provided by transport layer include ____.

A HTTP and FTP

B TCP and IP

C TCP and UDP

D SMTP

5. Which of the following services is not provided by TCP?

A Delay guarantees and bandwidth guarantees 延迟保证和带宽保证

B Reliable data transfers and flow controls

C Congestion controls

D In-order data transfers

6. These two minimal transport-layer services----____ and ____----are the only two services that UDP provides!

A process-to-process data delivery, error checking

B congestion control, reliable data transfer

C flow control, congestion control

D In-order data transfer, error checking

7. Port number's scope is ____ to ____.

A 0, 1023

B 0, 65535

C 0, 127

D 0,255

8. The port numbers ranging from ____to ____ are called well-known port number and are restricted.

A 0, 1023

B 0, 65535

C 0, 127

D 0,255

9. UDP socket identified by two components, they are ____.

A source IP addresses and source port numbers

B source IP addresses and destination IP addresses

C destination IP address and destination port numbers

D destination port numbers and source port numbers

10. TCP socket identified by a (an) ____.

A 1-tuple

B 2-tuple

C 3-tuple

D 4-tuple

11. Which of the following applications normally uses UDP services?

A SMTP

B Streaming multimedia

C FTP

D HTTP

12. Reliable data transfer protocol over a perfectly reliable channel is____.

A rdt1.0 B rdt2.0 C rdt3.0 D rdt2.1

13. Reliable data transfer protocol over a channel with bit errors and packet losses is ____.

A rdt1.0 B rdt2.0 C rdt3.0 D rdt2.1

14. Which of the following about reliable data transfer over a channel with bit errors is not correct?

A RDT2.0: assuming ACK and NAK will not be corrupted

B RDT2.1: assuming ACK and NAK can be corrupted

C RDT2.2: only use ACK-s

D RDT2.2: use both ACK-s and NAK-s 不使用 NAK

rdt2.2 是在有比特差错信道上实现的一个无 NAK 的可靠数据传输协议

15. Which of the following protocols is not pipelining protocols?

A TCP B rdt3.0

C GO-BACK-N D selective repeat

16. Which of the following is not correct about GBN protocol?

A Only using ACK-s

B Using cumulative ACK-s

C Receiver discards all out-of-order packets

D It is not pipelined protocol

17. Which of the following is not correct about SR protocol?

A receiver individually acknowledges all correctly received packets

B sender only resends packets for which ACK not received

C It limits sequence number of sent but un-ACK-ed packets

D It is not a pipelined protocol

18. Which of the following about TCP connection is not correct?

A It is a broadcast connection

B It is a point-to-point connection

C It is a pipelined connection
D It is a full duplex connection
19. The SYN segment is used for____.
A TCP connection setup
B TCP flow control
C TCP congestion control
D Closing a TCP connection
20. The FIN segment is used for____.
A TCP connection setup
B TCP flow control
C TCP congestion control
D Closing a TCP connection
21. How does TCP sender perceive congestion?
A Through a timeout event
B Through a receiving duplicate ACK-s event 重复的 ACK
C Both A and B
D Either A or B
22. Extending host-to-host delivery to process-to-process delivery is called transport-layer____ ____ and ____.
A multiplexing and de-multiplexing
B storing and forwarding
C forwarding and filtering
D switching and routing
23. UDP is a ____ service while TCP is a connection-oriented service.
A Connectionless
B Reliable
C Connection-oriented
D In-order
24. The UDP header has only four fields, they are____.
A Source port number, destination port number, length and checksum
B Source port number, destination port number, source IP and destination IP
C source IP, destination IP, source MAC address and destination MAC address
D source IP, destination IP, sequence number and ACK sequence number
25. There are two 16-bit integers: 1110 0110 0110 0110, 1101 0101 0101 0101. Their checksum is____.
A 0100010001000011
B 1011101110111100
C 1111111111111111
D 1000000000000000
26. The maximum amount of data that can be grabbed and placed in a segment is limited by the____.
A Maximum segment size (MSS)
B MTU
C Checksum

D Sequence number

27. The MSS is typically set by first determining the length of the largest link-layer frame that can be sent by the local sending host----the so-called____.

A Maximum transmission unit (MTU)

B MSS

C Checksum

D Sequence number

28. A File size of 500,000bytes, MSS equals 1000bytes. When we want to transmit this file with TCP, the sequence number of the first segment is 0, and the sequence number of the second segment is ____.

A 1000

B 999

C 1001

D 500000

29. Because TCP only acknowledges bytes up to the first missing byte in the stream, TCP is said to provide____.

A Cumulative acknowledgements 累积确认

B Selective acknowledgements

C 3 duplicate ACKs

D positive ACKs

30. Provided α=0.125, current value of Estimated-RTT is 0.4s, Sample-RTT is 0.8s, then the new value of Estimated-RTT is ____s.

A 0.45

B 0.6

C 0.7

D 0.8

31. Provided RcvBuffer=20,LastByteRcvd=20,LastByteRead=15, then RcvWindow=____.

A 14

B 15

C 16

D 10

32. TCP service does not provide____.

A Reliable data transfer　　B Flow control

C Delay guarantee　　D Congestion control

33. There are two states in TCP congestion control, which are ____.

A slow start and congestion avoidance

B safe start and congestion avoidance

C slow start and congestion abandon

D safe start and congestion abandon

34. The transport-layer protocol provides logical communication between ____, and the network-layer protocol provides logical communication ____.

A hosts, processes

B processes, hosts

C threads, processes
D processes, threads
35. To implement the multicast services the Internet employs the ____ protocol.
A FTP B TCP C IGMP D UDP
36. If an application developer chooses ____ protocol, then the application process is almost directly talking with IP.
A HTTP
B RIP
C CSMA/CD
D UDP
37. ____ maintains connection-state in the end systems. This connection state includes receive and send buffers, congestion-control parameters, and sequence and acknowledgment number parameters.
A UDP B TCP C DNS D HTTP
38. The host that initiates 开始 the session 会话 in the Internet is labeled as ____.
A server B user agent C client D router
39. With TCP there is no _____ between sending and receiving transport-layer entities.
A flow control B handshaking
C. congestion control D VC setup
40. The Internet's ____ service helps prevent the Internet from entering a state of gridlock 堵塞.
A datagram B congestion control
C sliding window D timeout event
41. Connection setup at the transport layer involves ____.
A server B only the two end systems
C client D router
42. A ____layer protocol provides for logical communication between applications.
A transport
B application
C networking
D MAC
43. In static congestion window, if it satisfies W*S/R > RTT + S/R, the Latency is ____.
A W*S/R – (RTT+ S/R)
B 2RTT + O/R
C 2RTT + O/R + (k-1)[W* S/R- (RTT + S/R)]
D 2RTT + S/R
44. The receive side of transport layer reassembles 重新装配 segments into messages, passes to ____layer.
A Application
B Networking
C Physical
D MAC

45. In the following four options, which one is correct?

A The variations in the SampleRTT are smoothed out in the computation of the EstimatedRTT

B The timeout should be less than the connection's RTT

C Suppose that the last SampleRTT in a TCP connection is equal to 1 sec. Then the current value of TimeoutInterval will necessarily be≥1 sec

D Suppose that the last SampleRTT in a TCP connection is equal to 1 sec. Then the current value of TimeoutInterval will necessarily be≤1 sec

46. The port number used by HTTP is ____.

A 80

B 25

C 110

D 53

47. The port number used by SMTP is ____.

A 80

B 25

C 110

D 53

48. The port number used by pop3 is ____.

A 80

B 25

C 110

D 53

49. The port number used by DNS is ____.

A 80

B 25

C 110

D 53

50. The port number used by FTP is ____.

A 20 and 21

B 20

C 21

D 53

51. A UDP socket identified by a ____ tuple(s).

A 2

B 4

C 1

D 3

52. A TCP socket identified by a ____ tuple(s).

A 2

B 4

C 1

D 3

53. A TCP socket does not include____.

A Source MAC address
B Source port number
C Destination IP address
D Destination port number

54. Which of following about UDP is not correct.
A It is a reliable data transfer protocol
B It is connectionless
C no handshaking between UDP sender, receiver
D it is a best effort service protocol

55. DNS uses ____ service.
A TCP
B UDP
C Both TCP and UDP
D None of above

56. Which of following about UDP is correct?
A Finer application-level control over what data is sent, and when
B No connection establishment (which can add delay), so no delay for establish a connection
C No connection state (so, UDP can typically support many active clients)
D Large packet header overhead (16-B)

57. Streaming media uses a ____ service normally.
A TCP
B UDP
C Both TCP and UDP
D None of above

58. The UDP header has only ____ fields.
A 2
B 4
C 1
D 3

59. Which of the following does not included in UDP header.
A Source port number
B Destination port number
C Checksum
D Sequence number

60. Which of the following is not a pipelining protocol.
A Rdt1.0
B Go-Back-N
C Selective repeat
D TCP

61. In the following four descriptions about MSS and MTU, which one is not correct?
A The MSS is the maximum amount of application-layer data in the segment
B The MSS is the maximum size of the TCP segment including headers
C The MSS is typically set by MTU

D The MTU means the largest link-layer frame

62. The job of gathering data chunks, encapsulating each data chunk with header information to create segments and passing the segments to the network is called ____.

A multiplexing

B de-multiplexing

C forwarding

D routing

63. In the following four descriptions about the relationship between the transport layer and the network layer, which one is not correct?

A The transport-layer protocol provides logical communication between hosts

B The transport-layer protocol provides logical communication between processes

C The services that a transport-layer protocol can provide are often constrained 束缚 by the service model of the network-layer protocol

D A computer network may make available multiple transport protocols

64. Suppose the following three 8-bit bytes: 01010101, 01110000, 01001100. What's the 1s complement of the sum of these 8-bit bytes?

A 00010001

B 11101101

C 00010010

D 10001000

65. The following four descriptions about multiplexing and de-multiplexing, which one is correct?

A A UDP socket is identified by a two-tuples consisting of a source port number and a destination port number.

B If two UDP segment have different source port number, they may be directed to the same destination process.

C If two TCP segments with different source port number, they may be directed to the same destination process.

D If two TCP segments with same destination IP address and destination port number, they must be the same TCP connection.

66. UDP and TCP both have the fields except ____.

A source port number

B destination port number

C checksum

D receive window

67. If we define N to be the window size, base to be the sequence number of the oldest unacknowledged packet, and next-seq-num to be the smallest unused sequence number, then the interval [nextseqnum,base+N-1] corresponds to packet that ____.

A can be sent immediately

B have already been transmitted and acknowledged

C cannot be used

D have been sent but not yet acknowledged

68. Which of the following about TCP is not correct?

A It is a connectionless protocol
B Point-to-point protocol
C Reliable, in-order byte steam protocol
D Pipelined protocol

69. Which of the following about TCP is not correct?
A It is a connectionless protocol
B full duplex data transfer protocol
C connection-oriented protocol
D flow controlled protocol

70. The maximum amount of data that can be grabbed and placed in a segment is limited by the ____.
A Maximum segment size (MSS)
B MTU
C Sequence number
D Check sum

71. The MSS is typically set by first determining the length of the largest link-layer frame that can be sent by the local sending host (the so-called____), and then will fit into a single link-layer frame.
A Maximum segment size (MSS)
B MTU
C Sequence number
D Check sum

72. The MSS is the maximum amount of ____layer data in the segment, not the maximum size of the TCP segment including headers.
A Application
B Transport
C Networking
D Link

73. Which of the following field is not used for connection setup and teardown?
A Sequence number
B TST
C SYN
D FIN

74. ____ is the byte stream number of first byte in the segment.
A Sequence number
B ACK number
C Checksum
D port number

75. ____ is the byte sequence numbers of next byte expected from other side.
A Sequence number
B ACK number
C Checksum
D port number

76. Because TCP only acknowledges bytes up to the first missing byte in the stream,

TCP is said to provide ____ acknowledgements.

A Cumulative

B Selective

C Single

D Negative

77. Fast retransmit means in the case that ____ duplicate 重复的 ACK-s are received, the TCP sender resend segment before timer expires 终止.

A 3

B 4

C 5

D 6

78. TCP____ means sender won't overflow receiver's buffer by transmitting too much, too fast.

A Flow control

B Congestion control

C Reliable data transfer

D Connection-oriented service

79. TCP provides flow control by having the sender maintain a variable called the ____.

A Receive window

B Congestion window

C Sliding window

D buffer

80. How does TCP sender perceive congestion?

A Timeout

B 3 duplicate ACK-s

C Both A and B

D None of above

81. Transport protocols run in ____.

A Servers

B Clients

C Routers

D End systems

82. Which of the following services is not provided by TCP?

A Delay guarantees and bandwidth guarantees

B Reliable data transfers and flow controls

C Congestion controls

D In-order data transfers

83. Which service does UDP not provide?

A multiplexing

B de-multiplexing

C error-detection

D error-correction

84. There are three major events related to data transmission and retransmission in the

TCP sender, which one is not in it?

A data received from application above

B de-multiplexing segment

C timer timeout

D ACK receipt

85. Which of the following applications normally uses UDP services?

A SMTP

B Streaming multimedia

C FTP

D HTTP

86. Which of the following about TCP connection is not correct?

A It is a broadcast connection

B It is a point-to-point connection

C It is a pipelined connection

D It is a full duplex connection

87. The SYN segment is used for____.

A TCP connection setup

B TCP flow control

C TCP congestion control

D Closing a TCP connection

88. Which service helps prevent the internet from entering a state of gridlock?

A reliable data transfer

B flow control

C congestion control

D handshaking procedure

89. The Internet's _____is responsible for moving packets from one host to another.

A application layer

B transport layer

C network layer

D link layer

90. In the following applications, which one is a bandwidth-sensitive application?

A E-mail

B web application

C real-time audio

D file transfer

91. In the following applications, which one uses UDP?

A E-mail

B web application

C file transfer

D DNS

92. In the following four descriptions, which one is correct?

A If one host's transport layer uses TCP, then its network layer must use virtual-circuit network.

B Datagram network provides connection service

C The transport-layer connection service is implemented in the router

D The network-layer connection service is implemented in the router as well as in the end system.

93. ____ is a speeding-matching service---matching the rate which the sender is sending against the rate at which the receiving application is reading.

A congestion control

B flow control

C sliding-window control

D variable control

94. In the following four descriptions about Rcv-Window, which one is correct?

A The size of the TCP RcvWindow never changes throughout the duration of the connection

B The size of the TCP RcvWindow will change with the size of the TCP RcvBuffer

C The size of the TCP RcvWindow must be less than or equal to the size of the TCP RcvBuffer

D Suppose host A sends a file to host B over a TCP connection, the number of unacknowledged bytes that A sends cannot exceed the size of the size of the RcvWindow.

95. There are 6 flag fields. Which one is to indicate that the receiver should pass the data to the upper layer immediately?

A PSH

B URG

C ACK

D RST

96. Suppose the TCP receiver receives the segment that partially or completely fills in gap in received data, it will ____.

A immediately send ACK

B immediately send duplicate ACK

C wait some time for arrival of another in-order segment

D send single cumulative

97. _____ imposes 利用 constrain 约束 on the rate at which a TCP sender can send traffic into the network.

A sliding window

B congestion window

C receive window

D variable window

98. Flow control and congestion control are same at that they all limit the rate of the sender, but differ in that ____.

A flow control limits its rate by the size of RcvWindow, but congestion control by the traffic on the link

B congestion control limits its rate by the size of RcvWindow, but flow control by the traffic on the link

C flow control mainly is accomplished by the sender, but congestion control by the receiver.

D flow control mainly is accomplished by the receiver, but congestion control by the link.

99. This job of delivering the data in a transport-layer segment to the correct socket is called ____.

A multiplexing

B de-multiplexing

C forwarding

D routing

100. If we define N to be the window size, base to be the sequence number of the oldest unacknowledged packet, and next-seq-num to be the smallest unused sequence number, then the interval [base, nextseqnum-1] corresponds to packet that ____.

A can be sent immediately

B have already been transmitted and acknowledged

C cannot be used

D have been sent but not yet acknowledged

101. ____ are the two types of transport services that the Internet provides to the applications.

A TCP and UDP

B connection-oriented and connectionless service

C TCP and IP

D reliable data transfer and flow control

102. In the following descriptions about persistent connection 持续连接, which one is not correct?

A The server leaves the TCP connection open after sending a response

B Each TCP connection is closed after the server sending one object

C There are two versions of persistent connection: without pipelining and with pipelining

D The default mode of HTTP uses persistent connection with pipelining

103. The field of Length in UDP segment specifies the length of ____.

A the UDP segment, not including the header

B the UDP segment, including the header

C the UDP segment's header

D the Length field

104. In TCP segment header, which field can implement the reliable data transfer?

A source port number and destination port number

B sequence number and ACK number

C urgent data pointer

D Receive window

105. In the following four descriptions about TCP connection management, which one is not correct?

A Either of the two processes participating in a TCP connection can end the connection

B If the FIN bit is set to 1, it means that it wants to close the connection

C In the first two step of the three-way handshake, the client and server randomly

choose an initial sequence number

D In the three segments of the three-way handshake, the SYN bit must be set to 1

106. Suppose host A sends two TCP segments back to back to host B over a TCP connection. The first segment has sequence number 42, and the second has sequence number 110. If the 1st is lost and 2nd arrives at host B. What will be the acknowledgment number?

A 43 B ACK42

C 109 D ACK110

Choices:

1~5	ADBCA		6~10	ABACD	
11~15	BACDB				
16~20	DDAAD				21~25
DAAAA		26~30	AAAAA		
31~35	BCABC				36~40
DBCDB		41~45	BACAA		
46~50	ABCDA				51~55
ABAAB		56~60	DBBDA		
61~65	BAABB				66~70
DAAAA		71~75	BAAAB		
76~80	AAAAC				81~85
DADBB		86~90	AACCC		
91~95	DDBCB				95~100
CBABD		101~106	ABABDB		

1. Consider sending an object of size O=500,000bytes from server to client. Let S=500 bytes and RTT=0.2s. Suppose the transport protocol uses static windows with window size 5. For a transmission rate of 100Kbps, determine the latency for sending the whole object. Recall the number of windows K=O/ WS), and there is K-1 stalled state (that is idle time gaps).

1. Solution:

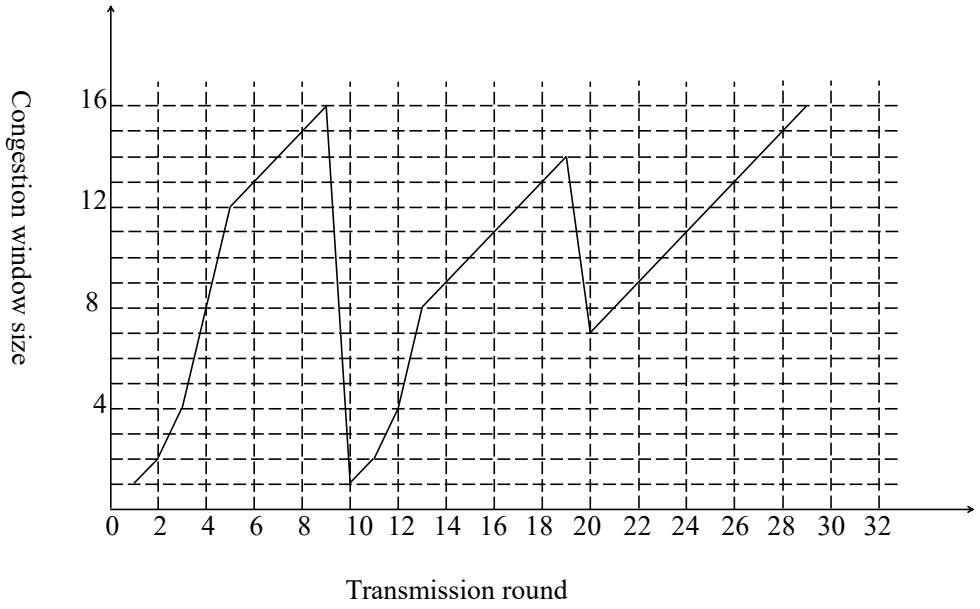
K=O/(WS)=500*8*1000/(5*5000*8)=200

Latency=2RTT+O/R+(K-1)(S/R+RTT-WS/R)

=0.4+500*1000*8/100000+(200-1)(500*8/100000+0.2-5*500*8/100000)

=48.36s

2.Consider the following plot of TCP congestion window size as a function of time.



Fill in the blanks as follow:

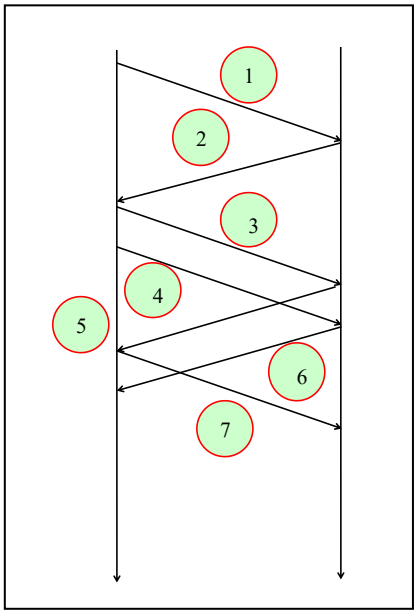
a) The initial value of Threshold 门限 at the first transmission round is ____.
b) The value of Threshold at the 11st transmission round is ____.
c) The value of Threshold at the 21st transmission round is ____.
d) After the 9th transmission round, segment loss detected by ____.
   (A) Timeout
   (B) Triple duplicate ACK
e) After the 19th transmission round, segment loss detected by ____.
   (A) Timeout
   (B) Triple duplicate ACK
f) During ____ transmission round, the 18th segment is sent.

2. Solution:

a) 12 b) 8 c) 7
d) A e) B f) 5

3.Consider the TCP reliable data transfer in the given graph. If in Segment 1's Sequence number =10,data="AC", please fill in the following blanks.

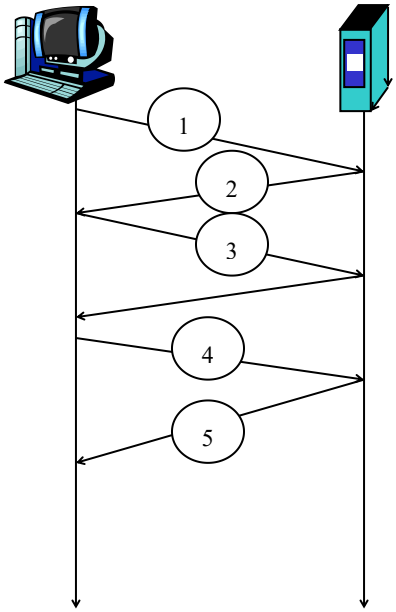
a) In Segment 2, ACK number=____;
b) In Segment 3, Sequence number =____; data="0123456789"
c) If there are some bits corrupted in segment 3 when it arrives Host B, then the ACK number in Segment 5 is ____; and the ACK number in Segment 6 is ____.



3. Solution:

a) 12 b) 12 c) 12, 22

4. The client A wants to request a Web page from Server B. Suppose the URL of the page is 172.16.0.200/experiment, and also it wants to receive French version of object. The time-sequence diagram is shown below, please fill in the blanks.



Packet① to Packet③ are TCP connection's segment, then:

Packet ①: SYN flag bit=__a__

ACK flag bit=___b___

Sequence number= 92

Packet ②: SYN flag bit=1

ACK flag bit=___c___

Sequence number=100

Packet ③: SYN flag bit=__d__

ACK flag bit=1

Sequence number=__e__

4. Solution:

a) 1 b) 0 c) 1 d) 0 e) 93

5. Consider sending an object of size O=100 Kbytes from server to client. Let S=536 bytes and RTT=100msec. Suppose the transport protocol uses static windows with window size W.

(1) For a transmission rate of 25 kbps, determine the minimum possible latency. Determine the minimum window size that achieves this latency.

(2) Repeat (1) for 100 kbps.

5. Solution:

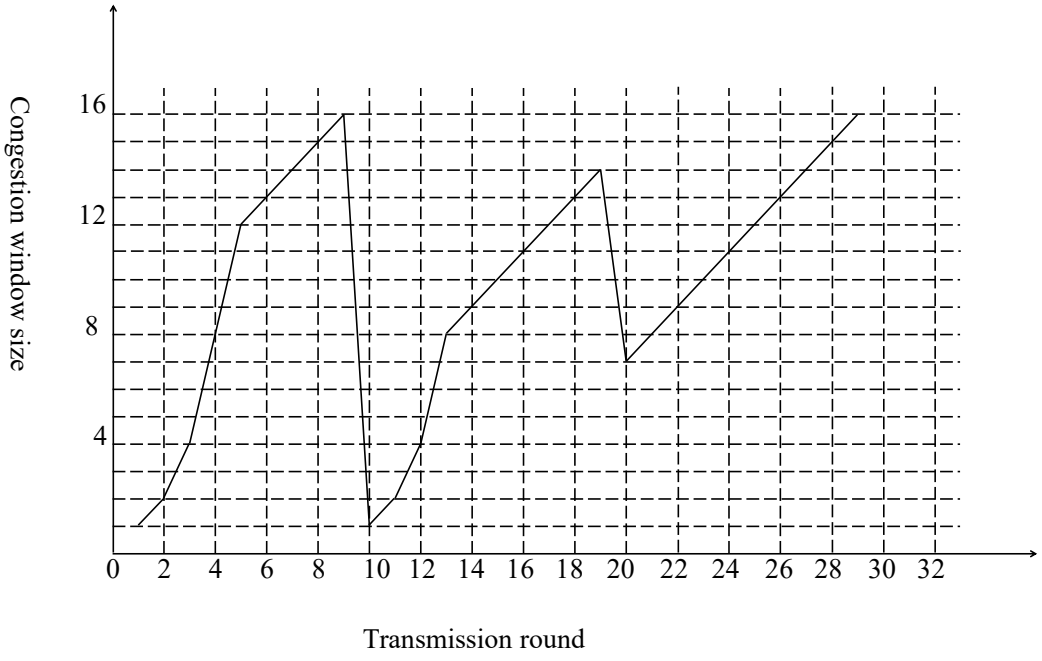
(1) Latency=2RTT + O/R =2*0.1+100*8/25= 0.2+32=32.2 (s)

W* S/R > S/R+RTT---- W>1.6, so W=2

(2) Latency=2RTT + O/R =2*0.1+100*8/100= 0.2+8=8.2 (s)

W* S/R > S/R+RTT----W>3.3, so W=4

6. Consider the following plot of TCP congestion window size as a function of time. Please fill in the blanks as below.



a) The initial value of Threshold at the first transmission round is____.

b) The value of Threshold at the 11th transmission round is_____.

c) The value of Threshold at the 21st transmission round is_____.

d) After the 9th transmission round, _____ occurs.

e) After the 19th transmission round, ____ are detected.

6. Solution:

a) 12 b) 8 c) 7 d) timeout e) 3 triple ACK