Computer Networks

Name: [redacted] Section: [redacted] Roll No: [redacted]

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1. Suppose host A sends five TCP segment to host B over TCP connection. The first segment has sequence number 80; and the second has sequence number 120; the third segment has sequence number 160; the fourth segment has sequence number 200 and it carries 40 bytes of data.

2.

a. How much data is in the first segment? Please justify your answer. [2.5 points]

40 Bytes ; Reason : Sequence number means the first byte number of the byte segment sent. In this case seq. no. of second seg. - first seg. = 120 - 80 = 40 Bytes

b. How much data is in the second segment? Please justify your answer. [2.5 points]

40 Bytes ; Reason: Same as above. Seq. no. of third seg. - second seg. = 160 - 120 = 40 Bytes. 2

c. Suppose that the second segment is lost but the third, fourth and fifth segment arrive at B. In the Acknowledgement that host B sends to host A, what will be the acknowledgement numbers for third, fourth, fifth segment after the loss of the second segment? [3 points] 3

120 for all ; Reason: Acknowledgement number means the byte number the receiver expects. As it has received first segment, it expects the second segment

d. What will happen to the out of order segments? Justify your answer. [2 points] 2

In TCP, the out of order segments will be stored in a temporary buffer untill the required segment is received & then it will ~~a~~cummalatively achnowledge uptill all the segments received.

2. MCQs (Encircle the right answer) [20 points] 19

1.Which of the following is a key function of the transport layer? a) Routing b) Addressing c) Error detection d) Application layer interface	2. In TCP, which field in the header is used to reorder segments if they arrive out of order? a) Port number b) Sequence number c) Acknowledgment number d) Window size
3.Which of the following is not a component of the TCP three-way handshake? a) SYN b) FIN c) SYN-ACK d) ACK	4.What is the main purpose of flow control in TCP? a) To prevent data loss b) To ensure data integrity c) To prevent buffer overflow d) To ensure all packets are ordered
5.Which of the following is the standard port for HTTP? a) 443 b) 80	6.UDP is best suited for which of the following applications? a) File transfer b) Video streaming

4.5 [6]

- UDP Segment 3

← 32 bits →

~~Dest. Port~~	~~Source Ip~~
Source Port	Dest. Port
length	Checksum
data	segment

- TCP Segment ← 32 bits → ~~ERR~~ a partially correct 1.5

Source Port	Dest. Port
~~Source IP~~	~~Dest IP~~
length ?	checksum
~~Ack~~ Flags	Ack / seq no.
Data Segment	

Seq No (32)
ACK (32)
Header Length (4) | Reserved (6) | Flags (6) | Window (16)
Checksum | Ptr urgent data
Optional Application data (variable length)

c) 25 d) 23	c) Email d) Database access
7.Which is the standard port number for DNS over TCP/UDP? a) 23 b) 53 c) 80 d) 443	8.In TCP, the acknowledgment number in a segment header signifies which of the following? a) The last byte sent b) The next byte expected c) The sequence number of the segment d) The current window size
9.Which of the following indicates a connection is in a half-open state in TCP? a) SYN-SENT b) ESTABLISHED c) CLOSE_WAIT d) SYN-ACK	10.Which statement best describes the sliding window protocol in TCP? a) It allows data to be sent in small chunks. b) It controls the flow of data between sender and receiver. c) It restricts all data in a session to a single packet. d) It determines the number of packets lost.
11.UDP does not provide which of the following features? a) Multiplexing b) Reliable delivery c) Port addressing d) Checksum	12.Which mechanism in TCP uses duplicate acknowledgments to handle packet loss? a) Slow start b) Fast retransmit triggered by 3 duplicate ACKs to indicate packet loss c) Congestion avoidance d) Sliding window
13.How many maximum ports does the transport layer support? a) 64 $2^{16} = 65536$ b) 65,535 c) 10,000 d) 256	14.Which port is typically used for HTTP over SSL (HTTPS)? a) 80 b) 25 c) 443 d) 53
15.UDP is classified as a _____ protocol. a) Connection-oriented b) Stateless c) Reliable d) Flow-controlled	16.Which protocol uses the concept of "best-effort delivery"? a) TCP b) UDP c) HTTP d) SMTP
17.In a TCP connection, the size of cwnd is 3000 bytes and the size of rwnd is 4000. The host has sent 2000 bytes which has not been acknowledged now. How many more bytes the sender can be sent? [1point] a) 3000 b) 2000 c) 1000 $3000 - 2000 = 1000$ d) 5000	18.The value of the rwnd variable is usually fixed at the start of a connection establishment stage and never change throughout the duration of the same connection. [1 point] b. True b. False
19.What will be the size of rwnd in TCP? If RcvBuffer is 5000 bytes while LastByteRcvd (from network layer) is 3000 and LastByteRead (by application layer) is 1000. a.2000 bytes b. 3000 bytes c. 1000 d. 4000 $5000 - (3000 - 1000)$	20.If a RcvBuffer is 3000 bytes for a TCP connection, then what will be the initial value of rwnd set by receiver? a.0 bytes b. 1000 bytes c. 2000 bytes d. 3000 bytes

Services of Transport Layer: [4]

1. Process-to-Process Delivery (End-to-End)
2. Reliable Data Transfer (TCP specifically)
3. Congestion Control (TCP specifically)
4. Flow Control