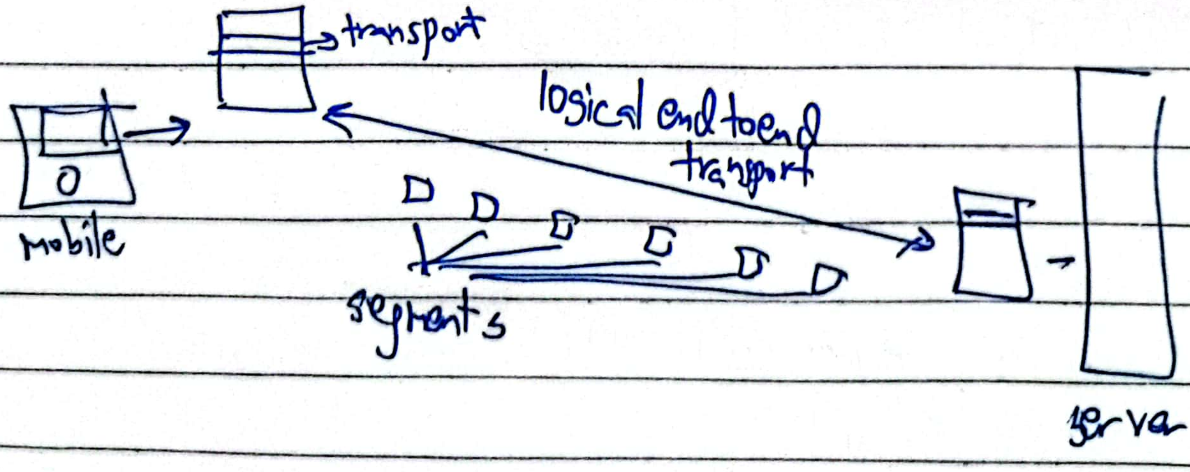
CN Assignment 2
21K-3153

Q1

(i) Transport layer ensures data is sent reliably regardless of physical structure between devices.

This is done by the sender breaking application message in segments and the reciever reassembling the segments. The 2 protocols used to do this are TCP/UDP.

TCP provides connection oriented communication, UDP provides connectionless communication



ii UDP can be used for:

- streaming multimedia applications (loss tolerant)
- video conferencing applications (loss tolerant)
- ~~video~~ voice over IP (some loss is tolerable)
- ~~video games~~ online video game

(iii) rdt_recv is called when a packet arrives on the receiver side of the channel. It ensures data correctness through checksum, ensures correct order of packets and also asks for missing packets to be retransmitted

rdt_send is called from above (by app). Passes data to deliver to receiver upper layer. It divides data into packets, adds headers and sends packet to the receiver upper layer

(iv) udt_send is called by rdt to transfer packets over an unreliable channel to the receiver. adds sequence numbers, header info and ensure reliability. It also re transmits failed packets.

Q2

```
 1                          2
0111 0010 1011 0011   [1011 0011 1010 1000]

   3  [1011 1011 0011 0101]

  1  11       111    1
     0111  0010  1010  1100  11
+    1011  0011  1010  1000
   -------------------------
   1 0010  0110  0101  1011
   ↓
wrapround                     1
+
   -------------------------
     0010  0110  0101  1100   ← 1+2
+    1011  1011  0011  0101
   -------------------------
     1110  0001  1001  0001
   -------------------------
               ↓
        after 1's complement

  [ 0001  1110  0110  1110 ]
```

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216
× 14
64
16 -
224

Q3

0050
0001 0050 0000 0001 0000 0000
3FF0 0000 0003 FFFF 0100 0000
0010 0000

X=3 Y=51 Z=5

(1) Sourre Port number = $(0001)_{16}$ HEX = $\boxed{1 \text{ DEC}}$

(2) Destimation Port number = $(0050)_{16}$ HEX =

~~0×16+0~~

0 + 0 + (5×16) + 0 = $\boxed{80 \text{ DEC}}$

(3) Sequance Number: $(0000\ 0001)_{16}$ HEX = $(1)_2$ DEC

(4) Acknowlgment Number: $(00000000)_{16}$ HEX = $(0)_2$ DEC

(5) TCP Header length: $(3)_{HEX}$ = 3 DEC = 12

3×4 = 20 byte

F0 → 1111 0000 → fin bit
syn

(6) ACK bit: 1 | FIN bit = 0
(7) SYN bit: 0 |

$\underline{64}$

(9) Window Size $= (0000)_{16} = 0$ Dec

(10) Checksum $= (0003)_{Hex} = 3 \times 16^0 = 3 \times 1 = \boxed{3 \text{ Dec}}$

Q4

IP = 202.28.33.21

	SP	DP	length	Checksum
UDP =	0019	D364	001C	001C

(1) source port $= (0019)_{16}$

$16 + 9 = (25)_{10}$

(2) socket address of sender's end:

source port number + source IP address

$\boxed{202.28.33.21 : 25}$

(3) total length of datagram: 001C

$1 \times 16 + 12$ (C)

$16 + 12 = \boxed{28}$ byte

(4) length of data: Total len of datagram - length of UDP header

$28 - 8 = 20$ bytes

~~(e) Destination Port = 54122~~

~~Source port = 25~~

(e) Destination port: 54122

Source port = 25

client to server, possibly

cannot be known for sure without

destination IP address