Due by the end 11/3. Grade 8 points.
Upload **one PDF file** with the written answers onto eLearning. The naming convention is "**Firstname_Lastname.pdf**".

1. (1 point) Why does UDP exist? Would it not have been enough to just let user processes send raw IP packets?

The User Datagram Protocol (UDP) has both lower overhead and latency when compared to the Transmission Control Protocol (TCP). Additionally, UDP is a simpler protocol to implement. As a result, UDP would be preferred for time-sensitive tasks, such as streaming, or for straightforward tasks where security is not an issue.

While it would be possible to send raw IP packets, UDP offers a standardized approach for processes to communicate with one another across the network with the benefit of speed.

2. (1.5 points) If the TCP round-trip time, RTT, is currently 30 msec and the following acknowledgements come in after 26, 32, and 24 msec, respectively, what is the new RTT estimates (3 answers)? Use $\alpha = 0.1$.

EstimatedRTT = (1 - α) * EstimatedRTT + α * SampleRTT

ERTT0 = (1 - α) * EstimatedRTT + α * SampleRTT = (1 - 0.1) (30) + (0.1) (26) = 29.6

ERTT1 = 1 - α) * ERTT0 + α * SampleRTT = (1 - 0.1) (29.6) + (0.1) (32) = 29.84

ERTT2 = ERTT1 + α * SampleRTT = (1 - 0.1) (29.84) + (0.1) (24) = 29.256

3. (1 points) Suppose Host A sends two TCP segments back to back to Host B over a TCP connection. The first segment has sequence number 90; the second has sequence number 110.

a. How much data is in the first segment?

The sequence numbers in TCP represent the byte number of the first byte in the segment. The difference between the first and second segment may be used to identify how much data was in the first segment.

110 - 90 = 20 bytes of data

b. Suppose that the first segment is lost but the second segment arrives at B. In the acknowledgement that Host B sends to Host A, what will be the acknowledgement number?

If the second segment arrives first, then the acknowledgement number will be the first segment's sequence number: 90. This is to indicate that Host B is still waiting for bytes 90 and onwards.

4. (0.5 point) A process on host 1 has been assigned TCP port p, and a process on host 2 has been assigned TCP port q. Is it possible for there to be two or more TCP connections between these two ports at the same time?

A pair of ports is set up for only the connection between one another until they disconnect, so it is not possible for there to be more than connections between the two ports.

5. (0.5 point) Convert the IP address whose hexadecimal representation is C22F1582 to dotted decimal notation.

C22F1582 -> C2.2F.15.82 -> 194.47.21.130

6. (0.5 point) A network on the Internet has a subnet mask of 255.255.240.0. What is the maximum number of hosts it can handle?

255.255.240.0 -> 11111111.11111111.11110000.00000000

The number of addresses usable for addressing hosts is 2^N – 2 where N is the number of bits for host id and 2 addresses are reserved (for network ID and local broadcast address).

2^N – 2 = 2^(12) - 2 = 4094

7. (1 point) Use the traceroute (UNIX) or tracert (Windows) programs to trace the route from your computer to 8.8.8.8. Write down the output of the command.

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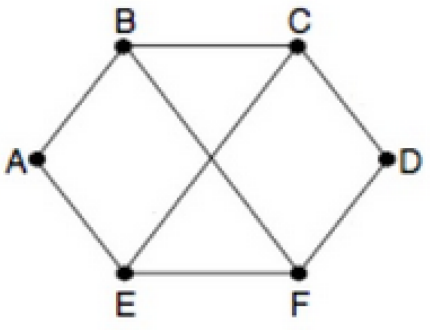
traceroute to 8.8.8.8 (8.8.8.8), 30 hops max, 60 byte packets
 1  * * *
 2  corefo-xe-1-0-13.utdallas.edu (10.222.4.111)  4.591 ms  4.920 ms  6.223
ms
 3  * * *
 4  pa-eth-2-14-unit-600.utdallas.edu (10.222.1.2)  4.823 ms  5.847 ms
5.827 ms
 5  * * *
 6  mx204-1-et-0-0-1-unit-700.utdallas.edu (129.110.5.35)  6.060 ms  1.885
ms  3.235 ms
 7  208.76.224.208 (208.76.224.208)  3.612 ms  2.343 ms  2.266 ms
 8  74.200.180.88 (74.200.180.88)  3.481 ms  3.727 ms  3.994 ms
 9  74.200.180.164 (74.200.180.164)  4.054 ms  4.127 ms  4.032 ms
10  74.200.144.61 (74.200.144.61)  4.331 ms  4.816 ms  3.701 ms
11  108.170.240.129 (108.170.240.129)  4.929 ms 108.170.240.193
(108.170.240.193)  4.234 ms 108.170.252.129 (108.170.252.129)  3.566 ms
12  142.251.60.145 (142.251.60.145)  3.667 ms 142.251.76.37 (142.251.76.37)
3.925 ms 142.251.60.45 (142.251.60.45)  3.809 ms
13  dns.google (8.8.8.8)  3.308 ms  4.205 ms  3.457 ms
```

8. (2 points) Consider the network in the figure below (nodes are ordered alphabetically). Distance vector routing is used, and the following vectors have just come in to router C: from B: (5, 0, 8, 12, 6, 2); from D: (16, 12, 6,0, 9, 10); and from E: (7, 6, 3, 9, 0, 4). The cost of the links from C to B, D, and E, are 6, 3, and 5, respectively. What is C's new routing table? Give both the outgoing line to use and the cost. (Please describe the inference details.)



C -> B = 6
C -> D = 3
C -> E = 5

In order to reach A, the minimum of the routes would be through router B (11),

B, the minimum would be through router B (6),

C, the minimum would be through router E (8),

D, the min would be router D (3),

E, the min would be router E (5), and

F, the min would be router B (8).

A	11	B
B	6	B
C	8	E
D	3	D

E	5	E
F	8	B