CMSC 417 Computer Networks **Fall 2021**

First Third-Term Exam

Open book and notes; Take Home *Due Friday Oct. 8th before 5 PM.*

⊕ *Do not forget to write your name on the first page. Initial each subsequent page.*
⊕ *Be* **neat** *and* **precise**. **I will not grade answers I cannot read.**
⊕ *You should draw simple figures if you think it will make your answers clearer.*
⊕ *Good luck and remember, brevity is the soul of wit*

- All problems are mandatory
- I cannot stress this point enough: **Be precise**. If you have written something incorrect along with the correct answer, you should **not** expect to get all the points. I will grade based upon what you **wrote**, not what you **meant**.
- Maximum possible points: 50 + bonus.

Name: _____

UID: _____

Problem	Points
1	
2	
3	
4	
5	
Total	

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	2	4	8	16	32	64	128	256	512	1024	2048	4096	8192	16384	32768	65536

1. Nomenclature

   (a) Describe the following terms: (2 points each)

   - Autonomous System

   - CIDR

   - Multi-homed AS

   - Poisoned Reverse

   - Selective ACK (SACK)

2. Routing

(a) List two advantages of Link State routing over Distance Vector (2 points)

(b) Give an example that shows the difference between regular Distance Vector (DV) and DV with Split Horizon. (2 points)

(c) How is TTL as used in Link State Routing different from IPv4? (3 points)

(d) What is a "triggered update" in Distance Vector. Are they necessary? Why or why not? (3 points)

3. Internet Protocol

(a) Suppose you are allocated the prefix 44.100.101.0/23.

i. How many IP addresses do you control? (1 point)

ii. Divide your allocation into three subnets, two of equal size and one double the size of the others. For each subnet, list the following: (3 points)

	Subnet-id	Mask	Broadcast	# hosts	Highest Address	Lowest Address
Subnet 0						
Subnet 1						
Subnet 2						

(b) Suppose a IP fragment with ID 1023, offset 128, MF=1, DF=0, TTL=17 and payload size 532 bytes is transmitted on a link with MTU 276 bytes. List the header values for the resultant fragments. You may assume no IP options; IP Len includes header. You may assume that link MTU of x means an IP datagram of total length x can be sent over the link. (3 points)

	IP ID	Offset	MF	DF	TTL	IP Len.
Fragment 0						
Fragment 1						
Fragment 2						

(c) IP reassembly code receives a datagram with previously unseen Identification=417, Total Len **1044** bytes, MF flag=1, and offset=**8191**. How should this datagram be processed. (3 points)

4. CIDR, BGP

(a) What is the difference between a *stub* and a *transit* AS? (2 points)

(b) Provider P has four customers with allocations 112.8.32/24, 112.8.33/24, 112.8.34/24, and 112.8.35/24. What CIDR prefix should P advertise. (2 points)

(c) UMD has two providers, Cogent and Internet2. Internet2 only advertises prefixes from academic institutions. What techniques can can UMD use to ensure that all outgoing traffic to academic institutions is carried by Internet2? (3 points)

(d) UMD wants to run a remote campus in Lyon, France with address allocation 128.8.10/24. What prefixes and AS numbers should be advertised from College Park and Lyon? (3 points)

5. Mobile IP, Implementation

   (a) What are the duties of the Home Agent in Mobile-IP?. (4 points)

   (b) Function `dispatch` has the following prototype:

```
void dispatch(int *sd_set,  int n_sd,  void (*net_reader)(int),
void (*ui_updater)(void));
```

   `dispatch` takes in an array of socket descriptors (`sd-set`) of length `n-sd`, and two functions `net-reader` and `ui-updater`. Provide an implementation of `dispatch` that invokes `net-reader` for every descriptor that is ready to read, and invokes `ui-updater` every 1/24th of a second. `dispatch` should continue this read/UI-update cycle forever. Do not use multiple processes, threads or signals (e.g., SIGALRM). (6 points)

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