CS-542 Computer Networks I: Fundamentals
Summer 2025 HW1 (65 points)

Submission instructions

- *Due date: Sunday, June 15, 11:59 pm Central Time (i.e. local time in Chicago)*

- *Late submissions and submissions violating these instructions will NOT be accepted.*

- *No handwritten submissions. No credit will be given for such submissions.*

- *Teamwork is allowed (max. 3 students/team). Individual submissions are also OK.*

- *Upload your assignment (pdf format only) to Canvas or Lumina (Beacon students). Submissions in formats other than pdf will be disregarded.*

- *One submission per team only. Type names, A#, and section numbers of all the team members on the front page. Do not submit multiple copies of your HW (e.g. by each team member). It is very confusing and will be penalized (25% of your score). Clearly indicate how each team member contributed to your teamwork.*

- *Show your work and explain every step of your solution for full credit. Only partial credit will be given for a correct final answer with missing calculations, no supporting explanations or unclear justifications.*

- *My TAs Manushi Patel (mpatel188@hawk.iit.edu) is responsible for grading this HW assignment. Feel free to ask questions if something is not clear but don't send me or my TA:*
  - Your partial solutions with inquiries "Is that what you expect?".
  - Questions, the answers to, may give explicit hints on how to solve the HW problems

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1. **(1 point)** What is the range of addresses of the 65th block of Class A?

2. **(4 points)** Consider fixed-length subnetting. What is the minimum number of created subnets if the desired number of subnets is:

a. 6

b. 62

c. 122

d. 250

3. **(3 points)** If you subnet the network 11.0.0.0 with a subnet mask of 255.255.240.0, what is the maximum number of subnets and usable addresses per subnet? A usable address is an address that can be assigned to a host or a router. Assume classful addressing.

4. **(3 points)** Convert the IP address 0xDA0121C8 to the dotted decimal notation. What is the class of this IP address?

5. **(2 points)** In the network 112.0.0.0/15

a. A router wants to send a packet to every host in this network. What should be the destination IP address?

b. A host wants to send a packet to every host in this network. What should be the destination IP address?

6. **(4 points)** Find the network address, the direct broadcast address, and the total number of addresses in the network, if one of the addresses is 183.70.230.23/20.

7. **(5 points)** The network 126.154.24.0/21 is divided into 32 subnets. Can the following IP addresses be assigned to hosts? Explain your answers.

a. 126.154.24.0

b. 126.154.24.128

c. 126.154.25.120

d. 126.154.31.255

8. **(4 points)** Find the 2149th address and the last address of the block 123.0.0.0/18. .

9. **(4 points)** The addresses of two hosts in a certain network are 187.93.25.97 and 187.93.127.230. Assume classful addressing. How many addresses are there:

a. Between these two addresses?

b. In the entire network?

10. **(8 points)** An organization is allocated a block of addresses 25.4.32.0/22 and needs 7 subnets. Find the number of addresses in this block and design the following subnets. Give the mask and the range of addresses for each of them.

a. 1 subnet of 512 addresses

b. 2 subnets of 128 addresses

c. 2 subnets of 64 addresses

d. 2 subnets of 32 addresses

11. **(4 points)** An organization has received an IP address block for its internal network. The IP address 154.101.43.163 is identified as the 36th address within this block. The organization requires 72 IP addresses to accommodate hosts and networking devices.

a. Determine the full range of IP addresses allocated to this organization.

b. Are there any unused IP addresses in this allocation? If so, calculate the number of such addresses.

12. **(5 points)** A routing table of a certain router (the next-hop addresses have been omitted) is given below. For each of the following destination IP addresses, determine which interface the router would use to forward the packet. Explain each answer.

a. 187.123.224.131

b. 172.15.45.12

c. 201.4.200.20

d. 187.123.224.50

e. 180.75.20.10

Mask	Network Address	Interface
/25	187.123.224.0	M0
/18	201.4.0.0	M1
/17	201.4.128.0	M2
/15	180.74.0.0	M3
Default	Default	M4

13. **(16 points)** The block of addresses 146.157.224.0/19 is divided into 3 subblocks. The 1st subblock is allocated to a group of 12 customers, each of which needs 64 addresses. The 2nd subblock is allocated to a group of 9 customers, each of which needs 32 addresses. The 3rd subblock is allocated to a group of 5 customers, each of which needs 16 addresses.

   a. **(6 points)** Design the three subblocks. Find the mask for each of them (i.e. for each subblock not for each customer).

   b. **(2 points)** What is the range of addresses (find the first and last of them) allocated to the 10th customer in the 1st subblock?

   c. **(2 points)** What is the range of addresses (find the first and last of them) allocated to the 5th customer in the 2nd subblock?

   d. **(2 points)** What is the range of addresses (find the first and last of them) allocated to the 3rd customer in the 3rd subblock?

   e. **(3 points)** How many addresses are still available after this allocation in each of the three subblocks?

   f. **(1 point)** How many addresses in the entire original block are still available for allocation?

14. **(2 points)** What are the main duties of the Presentation Layer?