CS 542 – Computer Network Fundamentals 1
Spring 2021 - Homework - 1 **(70 points)**

Instructions:

- Please submit soft copies on the blackboard.
- Team submissions are accepted.
- A team of 1 – 3 is accepted. Please mention all the team members' names and CWID (A number) on the first page.
- For team submissions, one submission is sufficient. Anyone from the team can submit—no need for everyone in the group to submit.
- All should submit typewritten documents, not handwritten ones.
- **Show the complete step-by-step solution for full credits. If there is no proper explanation and justification for your final answer, only partial credits are given, even though your answer is correct.**
- Please contact **Viswatej Kasapu (vkasapu@hawk.iit.edu)** if something is not clear.
- **The due date is Friday, Apr 02nd, 2021, at 11:59 PM (Central Time).**
- **Submissions after the due date are not accepted.**

1. What is the range of addresses that can assign to users in the 2021 block of class C? **(3 points)**
2. Convert the number C0514019 in the hexadecimal base to the dotted-decimal notation. What is the class of this address? (consider classful addressing). **(5 points)**
3. Define the 1202 block of class B? (Give first and last address in the block) **(3 points)**
4. Convert the decimal number 5141.01568603515625 to the base 256 number system. **(5 points)**
5. What is the value of $\frac{60.63.12.12.0}{20.21.04.04}$? Give results in 256 base system. (Given numbers are in 256 base system) **(4 points)**
6. An organization is granted the block 142.200.208.0/21. The administrator wants to create 16 subnets.
    a. Find the subnet mask (**1 point)**
    b. Find the number of addresses in each subnet (**1 point)**
    c. Find the subnet address and the direct broadcast address for the first subnet. **(2 points)**
    d. Find the 4^{th} and 99^{th} addresses in the last subnet. **(4 points)**

7. Give the mask in the dotted-decimal notation:
    a. For a block of Class A which results in 128 subnets **(1 point)**
    b. Which combines 128 blocks of Class C into a supernet **(1 point)**
8. Convert an IP address 256.128.64.32 to the binary notation **(2 points)**
9. The 14th address of a block assigned to a specific organization is 120.65.89.141. The organization needs 120 addresses to give to its 120 users. Find the mask and define this block of addresses. Is there any wastage of the IP addresses? If yes, how many? (Note: The number of router interfaces is 2)**(4 points)**
10. A block of addresses 120.200.240.0/20 granted to an ISP. These addresses are allocated between two groups of customers. The first group has 20 customers, each of which needs 64 addresses, the second group has 20 customers, each of which needs 128 addresses. Show the subblocks and range of addresses for the 10th customer of the first group and the 10th customer of the second group. How many addresses are still available after this allocation? **(5 points)**
11. Find first address, last address, and number of addresses in the block, if one of the addresses in a block is 140.240.90.25/20 **(3 points)**
12. Consider the following routing table (the next-hop address is omitted):

Mask	Network address	Interface
/27	144.56.55.0	M0
/26	123.80.97.0	M1
/25	123.80.97.128	M2
/24	118.114.132.0	M3
Default	Default	M4

Give the interface number for a packet whose destination IP address is:

i) 144.56.55.31 **(1 point)**
ii) 144.56.56.31 **(1 point)**
iii) 123.80.97.60 **(1 point)**
iv) 123.80.97.200 **(1 point)**
v) 123.80.97.88 **(1 point)**
vi) 118.114.133.1 **(1 point)**

13. The routing table of routers R1, R2, and R3 are given. Draw the possible network configuration with all 3 routers, not separate configurations corresponding to each routing table. Indicate the next-hop addresses in the figure. **(10 points)**

R1:

Mask	Network Address	Next-Hop Address	Interface Number
/24	80.70.56.0	100.160.32.67	M2
/24	130.135.7.0	150.137.45.78	M1
/16	180.170.0.0	----------	M0
/16	100.160.0.0	----------	M2
/16	150.137.0.0	----------	M1
Default	Default	180.170.4.6	M0

R2:

Mask	Network Address	Next-Hop Address	Interface Number
/24	80.70.56.0	----------	M0
/16	100.160.0.0	----------	M1
Default	Default	100.160.56.7	M1

R3:

Mask	Network Address	Next-Hop Address	Interface Number
/24	130.135.7.0	----------	M0
/16	150.137.0.0	----------	M1
Default	Default	150.137.72.48	M1

14. Consider the network configuration below. A packet arrived at the router R3 with the destination address 150.14.8.56. Show how it is forwarded. (Assume classless addressing and mask of each network is /24) Create a routing table for R1 and R3. **(10 points)**