National University of Computer and Emerging Sciences (Lahore Campus)

Quiz 4: Network Layer (Chapter 4)

Name: _____ **Roll No:** _____ **Section:** BSE-6B1 (Spring 2026)

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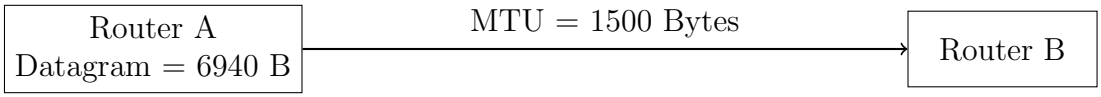
1. (5 points) **IPv4 Fragmentation**

   An IPv4 datagram with a total length of 6940 bytes (20 bytes header + 6920 bytes payload) originates at Router A. It must traverse a link with an MTU of 1500 bytes to reach Router B. Determine the values for the following fields for each fragment generated:

   1. Total length of each fragment (header + data).
   2. Offset value of each fragment.

   Note: The length field in IP is Total Length (Header + Data). The Offset is in units of 8 bytes.



Solution:

- **MTU**: 1500 Bytes.
- **Max Payload per Fragment**: $1500 - 20$ (Header) $= 1480$ Bytes.
- **Total Data Payload**: $6940 - 20 = 6920$ Bytes.

Fragment #	Total Length (Bytes)	Offset (/8)
1	1500	0
2	1500	185
3	1500	370
4	1500	555
5	1020	740

Note: Offset calculation example for Frag 2: $1480/8 = 185$.

2. (10 points) **Subnet Addressing**

Consider the router and the two attached subnets (for two organisations) below (A and B). The number of hosts is also shown below. The subnets share the 23 high-order bits of the address space: 192.168.68.0/23.

- **Organisation A** has **76** hosts.
- **Organisation B** has **48** hosts.

Assign subnet addresses to each of the subnets (A and B) so that the amount of address space assigned is minimal, and at the same time leaving the largest possible contiguous address space available for assignment if a new subnet were to be added. Then answer the questions below:

1. What is the subnet address of subnet A? (CIDR notation)
2. What is the broadcast address of subnet A?
3. What is the starting address (first usable) of subnet A?
4. What is the subnet address of subnet B? (CIDR notation)
5. What is the ending address (last usable) of subnet B?

Solution:

1. 192.168.68.0/25
2. 192.168.68.127
3. 192.168.68.1
4. 192.168.68.128/26
5. 192.168.68.190