November 19th 2019

Computer Networks **1st Test**

- There are 14 question for 1 points, 3 questions for 2 points – 20 points to score.
- You have 45 minutes to complete the test.
- It is not allowed to use any electronic devices (e.g. smartphones, tablets) and paper notes.
- **Please write concisely and legibly!**

Your name: ……

Questions for 1 point:

1. What is the main responsibility of the Internet Registry organizations (e.g. RIPE)? IANA oversees global IP address allocation, autonomous system number allocation, media types, and other Internet Protocol-related symbols and Internet numbers. A regional Internet Registry manages the allocation and registration of Internet number resources (e.g. IP addresses and autonomous system numbers) within its region of the world.
2. In which case packet switching is more efficient than message switching? While messages are bigger than packets (at least two times).
3. What is the structure of the MAC-48 address? Individual/Group bit flag, Universal/Local bit flag, Organizational Unique Identifier, Natural Binary Code/Bitmask bit flag (only for group addresses), Network Interface Card number
4. What is the host number (index) pointed by the IPv4 address 197.202.233.14/24? 14
5. What is the meaning of the 197.202.233.0/24 IPv4 address in the subnet? It points a default route, when used as a destination address. It means "I have not yet assigned IP address", when used as a source address.
6. What are pros & cons of positive and negative acknowledgements?

   ACKs
   - Needlessly take bandwidth in reliable links
   - Slower retransmission

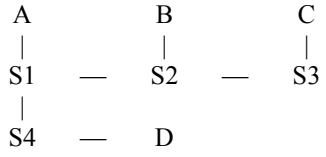
   NACKs
   - Can be frequent in unreliable links
   - Faster retransmission
   - Needs more buffers for retransmissions
   - Periodic ACKs help to free buffers

7. What for a host uses DHCP (Dynamic Host Configuration Protocol)? DHCP distributes network configuration parameters, such as IP addresses for interfaces, services, and bootstrap file localization. It allows for dynamic IP address assignment, leasing addresses for defined time period.
8. What for is the hop count field in the IP header? To drop a packet that circulates over a temporary loop. The mechanism protects switches against congestion.
9. What for is the protocol field in the IP header? To recognize the subsequent protocol that should obtain the packet for processing (e.g. TCP, UDP, ICMP).
10. What are the elements of total packet delay (what should we sum up)? Packet size divided by transmission speed (over all switches), signal propagation time over all links, store-and-forward time per all switches over the path, queuing time of all switches over the path.
11. What for a host uses RARP (Reverse Address Resolution Protocol)? The RARP server responds with the IP address that is assigned to the querying device, on the base of its MAC address.

12. What is the aim of ICMP (Internet Control Message Protocol)? A self-recovery from errors in the network and to enable network testing.
13. Is it possible to map an IPv4 into IPv6 address? Yes
    Is it possible to map an IPv6 into IPv4 address? No
14. Give 3 main disadvantages of NAT (Network Address Translation) servers. Main Internet concept is broken – no pear-to-pear visibility that disturb many applications. NAT server is a bottleneck for network throughput. Battery save terminals cannot be placed behind a NAT. Disable integrity verification of IP headers (IPSec).

Questions for 2 points:

1. Give forwarding tables for each of the switches S1 and S2 in the following network with destinations A, B, C, D. For the next-hop column, give the neighbour on the appropriate link rather than the interface number.



S1: *(destination, next hop)* (A, A) (B, S2) (C, S2) (D, S4)

S2: *(destination, next hop)* (A, S1) (B, B) (C, S3) (D, S1)

2. For the following IPv4 subnets, indicate the smallest and the largest IPv4 address inside the subnet: 200.123.0.0/16 200.123.0.1 – the smallest. 200.123.255.254 – the largest.
3. A bit stream is transmitted using bit injection mechanism (the unique start of header bit pattern is 01111110). Transform the following data bit stream to the transmitted one.

   001111110011111100111100

   00111110100111110<u>0</u>00111100

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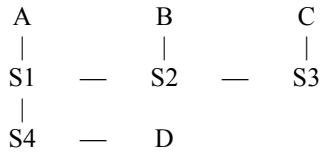
Your name: ……

Questions for 1 point:

1. What is the main responsibility of Internet Engineering Task Force? IETF develops and promotes standards for Internet. It is an open standards organization, with no formal membership or membership requirements.
2. What was the main reason for IPv6 construction? The small address space of IPv4.
3. In which conditions a circuit switching network is less efficient than a packet switching one? While there are small data chunks to be sent in big intervals.
4. What is the meaning of unicast, mulicast, anycast and broadcast addressing? Unicast – one interface; mulicast – group of destination interfaces, each of them should obtain the message; anycast – group of destination interfaces, one of them should obtain the message; broadcast – every interface in the network should obtain the message.
5. Describe the types of addresses defined by IEEE (2nd layer addresses). MAC-16, MAC-48, EUI-48, EUI-64. There are unicast, multicast, NULL and broadcast addresses. There are manufacturer (unique) and administrator (local) assigned addresses.
6. What is the host number (index) pointed by the IPv4 address 197.202.32.64/24? 64
7. What is the meaning of the 197.202.255.255/16 IPv4 address in the subnet? Broadcast.
8. What for is the Type of Service / Traffic Class field in the IP header? To enable routers sending packets using different priority queues.
9. What for is the port number field in the TCP header? To point a process on a given terminal node that is involved in the communication. It enables to recognize the end point application protocol (e.g. smtp, ftp, http) from one side and its client from the other.
10. What is the aim of XON/XOFF protocol? The data flow control.
11. What for a host uses ARP (Address Resolution Protocol)? The ARP server responds with the MAC address that is assigned to the querying device on the base of its IP address.
12. What is the aim of DHCP (Dynamic Host Configuration Protocol)? DHCP distributes network configuration parameters, such as IP addresses for interfaces, services, and bootstrap file localization. It allows for dynamic IP address assignment, leasing addresses for defined time period.
13. Give 3 main advantages of IPv6 with respect to IPv4. Huge address space. No need to use network address translation. Perfect auto-configuration. Built in mobility mechanisms. Routers can work faster.
14. What is the main reason to deploy NAT (Network Address Translation) servers? The lack of free public IPv4 addresses.

Questions for 2 points:

1. Give forwarding tables for each of the switches S3 and S4 in the following network with destinations A, B, C, D. For the next-hop column, give the neighbour on the appropriate link rather than the interface number.



S3: *(destination, next hop)* (A, S2) (B, S2) (C, C) (D, S2)

S4: *(destination, next hop)* (A, S1) (B, S1) (C, S1) (D, D)

2. For the following IPv4 subnets, indicate the smallest and the largest IPv4 address inside the subnet: 200.123.32.0/24 200.123.32.1 – the smallest. 200.123.32.254 – the largest.

3. A bit stream is transmitted using bit injection mechanism (the unique start of header bit pattern is 01111110). Transform the following received bit stream to the original data bit stream.

   01011110011111**0**0011111**0**100

   01011110011111**0**011111100