

# Internetworking Examination 2G1305

## Date 7<sup>th</sup> March, at 14:00 – 17:00

LCN IMIT KTH

- *No help material is allowed.*
- *You may answer questions in English or Swedish.*
- *Each problem's answer, except for section A, on a separate page.*

The exam is divided into three sections called A, B and C.

- **Section A** consists of 16 of multiple-choice questions. Each question is worth two points awarded if all correct alternatives (regardless of how many there are) are selected. Each missed correct alternative will reduce the score by one point. Each selected alternative that is wrong will also reduce the score by one point. The total score for a question will not be lower than zero.
- **Section B** consists of four short questions. Each correctly answered question is rewarded with 2 points.
- **Section C** consists of three essay questions where a more elaborative answer is required. A satisfying answer is rewarded with four points.

The grading is as follows:

- Grade 3: at least 26 points in section A alone.
- Grade 4:
  - at least 28 points in section A and
  - at least 4 points in section B and
  - at least 4 points in section C
- Grade 5:
  - at least 30 points in section A and
  - at least 6 points in section B and
  - at least 8 points in section C

Your name: .....

Your social security number (personnummer): .....

Your major (utbildningslinje): .....

Exam handed in at: .....	number of pages: .....	signature: .....
Points:	Section A: .....	Grade: .....
	Section B: .....	
	Section C: .....	

**Points scored:**

Question	Answered (check)	points worth	points received
1		2	
2		2	
3		2	
4		2	
5		2	
6		2	
7		2	
8		2	
9		2	
10		2	
11		2	
12		2	
13		2	
14		2	
15		2	
16		2	
Total section A:		32	
17		2	
18		2	
19		2	
20		2	
Total section B		8	
21		4	
22		4	
23		4	
Total section C		12	

## **Section A – multiple choice**

### **1. ARP/RARP**

Which of the following is/are true:

An ARP message,

- a. is encapsulated in an IP-datagram
- b. has its own Ethernet frame type
- c. is sent in order to find the MAC address given a IP address
- d. is sent in order to find the IP address given a MAC address

### **2. IP addressing**

Which of the following is/are true:

- a. 192.54.10.96 is a valid IP address in the 192.54.10.64/26 subnet
- b. 127.0.0.1 is a valid source address
- c. 255.255.255.255 is a valid destination address
- d. the subnet 193.10.32.0/19 has a subnet mask of 255.255.32.0

### **3. IP**

Which of the following fields belong to the IP header:

- a. complete datagram checksum
- b. time-to-live
- c. acknowledgement
- d. destination port
- e. source IP-address
- f. protocol field

### **4. BOOTP/DHCP**

Which of the following is/are true:

- a. if a host does not know its IP-address it cannot communicate with a DHCP server
- b. a BOOTP server will only lease an IP-address for a limited time
- c. only one DHCP server is allowed to exist in a subnet
- d. a DHCP reply contains information such as IP-address, subnetmask, gateway etc

### **5. IP routing**

Which of the following is/are true:

- a. RIP is a link state protocol
- b. OSPF gives all routers the same knowledge
- c. RIP uses TCP to communicate between routers
- d. BGP is an exterior gateway protocol
- e. RIP can use various metrics to measure distance
- f. OSPF is an exterior gateway protocol
- g. OSPF has support for load balancing

## 6. ICMP

Which of the following is/are true:

- a. ICMP messages are encapsulated in IP datagrams
- b. PING uses ICMP echo messages to test whether a destination is reachable
- c. ICMP messages are used by TCP to send acknowledge messages
- d. ICMP messages are used by UDP to determine the MTU
- e. a router that forwards an IP-datagram can receive an ICMP "host unreachable" message in return

## 7. TCP

If the Nagle algorithm is in use and you have already sent one "tinygram", how many additional tinygrams can you send before the first is acknowledged?

- a. 0
- b. 1
- c. 2
- d. 41
- e. 1500
- f. one congestion window's worth
- g. an unlimited number

## 8. UDP

Which of the following is/are true:

- a. a UDP header contains the destination IP-address
- b. the UDP checksum is optional and if not present the value in the field is zero
- c. the UDP checksum only covers the data portion of the package
- d. the arrival of a UDP datagram is acknowledged by an ICMP message
- e. the UDP source port is optional and if not valid for use in a reply, then the value of the field is zero <<--

## 9. Multicasting

Which of the following is/are true:

- a. the prune operation is use to eliminate a branch in a multicast tree
- b. multicast applications often use TCP as a transport protocol
- c. a host does not need any special routing table in order to send multicast messages
- d. multicast traffic can only be sent over multicast enabled routers

## 10. Mobile IP

Which of the following is/are true:

- a. Mobile IP utilizes the OSPF routing protocol to determine where the mobile host currently is.
- b. Mobile IP utilizes encapsulation to carry packets in tunnels when necessary
- c. The home agent always sends packets to the mobile host by using its home address.
- d. When a mobile host hears a router advertisement, it uses the source IP address as its new address.

## 11. NAT

Which of the following is/are true:

- a. NAT is used to allocate IP addresses in a local network
- b. A NAT gateway maps local IP address to one or more valid external IP address.
- c. A NAT gateway is completely transparent for communication between hosts on the local network and external hosts.
- d. The IP addresses used inside the NAT's local network must be private IP addresses.

## 12. VPN and IPsec

Which of the following is/are true:

- a. IPsec in tunnelling mode will preserve the original IP header
- b. a AH header authenticates the complete IP datagram
- c. AH and ESP headers can only be used in combination with TCP
- d. ESP uses a public-key algorithm to encrypt the data portion in an IP datagram

## 13. SNMP

Which of the following is/are true:

- a. MIB (management information base) specifies the data a managed device should provide
- b. SNMP messages are text based, similar to HTTP in structure
- c. SNMP defines operations such as: halt, reboot, start etc

## 14. DNS

Which of the following is/are true:

- a. DNS can resolve domain names to IP addresses or vice verse
- b. a host can request recursive lookup
- c. there is only one DNS root server on the Internet
- d. to find a mail server a host must know the name of the server before contacting a DNS

## 15. RTP

Which of the following is/are true:

- a. RTP is built using TCP as a transport protocol
- b. a RTCP receiver report contains information about received segments and jitter
- c. RTP timestamp resolution is 20 ms
- d. RTSP is used to control the streaming of content possibly delivered using RTP/RTCP

## 16. IPv6

Which of the following is/are true:

- a. each IPv6 extension header contain information about the type of the following extension header
- b. IPv6 provides unicast, multicast and anycast addressing
- c. a IPv6 host can create a locally unique IP-address using its MAC address
- d. IPv6 does not use any form of fragmentation
- e. the basic IPv6 header includes a header checksum

### ***Short questions:***

## 17. TCP (2p)

When is a TCP receiver required to send an “ack” immediately? Why?

## 18. TCP (2p)

Assume we use TCP port numbers to do type of service routing. What happens if we have to fragment packets?

## 19. Ports (2p)

Explain how ports are used, you should cover:

- a. the different usage of ports in TCP and UDP
- b. how application can open and connect to ports'

## 20. IP routing (2p)

Explain the basic principles of IP routing, you should cover:

- a. routing performed by a hosts and routers
- b. IP-address scheme and subnetting

## **Section C - essay questions:**

### **21. Link layer interaction with the network layer (4p)**

Explain how the link layer works, you should cover:

- a. translation from IP to MAC addresses
- b. how a host can determine its IP address
- c. how a host can learn the IP address of another host
- d. how network layer datagrams are encapsulated in an Ethernet frame

### **22. IP routing (4p)**

Explain how interior routing works, you should cover:

- a. distance-vector protocol
- b. link-status protocol
- c. compare the above
- d. why interior protocols are not suitable as exterior protocols

### **23. TCP congestion control (4p)**

Explain how TCP handles congestion, you should cover:

- a. how the sending window size changes as a result of lost messages
- b. the use of retransmission timeout and how it is determined
- c. how routers discard datagrams as a result of increased traffic
- d. how deadlocks are prevented when acknowledgments are lost