

*This exam has a total of 40 points. For every 3 multiple-choice questions with 4 options or fewer answered incorrectly, 1 point will be deducted. Only one option is correct unless stated otherwise in the statement. When prompted, it's required to check all correct options. The use of a calculator is not allowed. The exam duration is 70 minutes. **Follow answer sheet instructions.***

- 1** [1p] We talk about “convergence” of a routing algorithm when:
- ☐ a) All network traffic passes through a single router that acts as the network’s exit point.
 - ☐ b) All network traffic ends up at the sink router, regardless of its origin.
 - ☒ c) All routers in the network know the best option to send packets to any destination.
 - ☐ d) All routers in the network are within 16 hops of any other router; the network is then said to be convergent.
- 2** [2p] Select the FALSE statement about path vector routing:
- ☒ a) Path vector routing is similar to link-state routing.
 - ☐ b) Path vector routing is similar to distance-vector routing.
 - ☐ c) Path vectors include information about the entire network.
 - ☐ d) Path vectors are inter-domain routing systems.
- 3** [1p] What is the main difference between RIP and OSPF?
- ☐ a) RIP is an intra-domain routing protocol, while OSPF is an inter-domain one.
 - ☐ b) RIP uses link-state routing, while OSPF uses distance-vector routing.
 - ☐ c) OSPF uses TCP, while RIP uses UDP.
 - ☒ d) OSPF is more efficient than RIP in large networks.
- 4** [1p] In BGP routing, what is an AS (Autonomous System)?
- ☐ a) A set of routes shared within a local network.
 - ☐ b) A protocol used to exchange routing information between ISPs.
 - ☐ c) A grouping of IP addresses assigned to a single organization.
 - ☒ d) A collection of routers under the same administrative control with a common routing policy.
- 5** [2p] Regarding the operation of the BGP protocol:
- ☐ a) Best Group Protocol is used to improve multicast routing.
 - ☒ b) BGP configuration on a router is based on autonomous systems, not local networks.
 - ☐ c) It is used in combination with OSPF and RIP, since BGP routers cannot route without an underlying protocol.
 - ☐ d) It has been replaced in all networks by iBGP, Internet BGP.
- 6** [1p] DLNA, Digital Living Network Alliance, is related to multicast in the following way:
- ☐ a) It is a multicast protocol directly, used exclusively by Smart TVs.
 - ☒ b) It is a technology that uses the SSDP protocol, which as well uses multicast to discover devices on the network.
 - ☐ c) It is known as "Bonjour technology" used to connect Apple devices without the need for drivers.
 - ☐ d) It has nothing to do with multicast; it is a technology for screen mirroring from a mobile device within a LAN.
- 7** [2p] What is the range of IP addresses reserved for multicast in IPv4?
- | | |
|--|---|
| <input type="checkbox"/> a) 127.0.0.0 to 127.255.255.255 | <input checked="" type="checkbox"/> c) 224.0.0.0 to 239.255.255.255 |
| <input type="checkbox"/> b) 192.168.0.0 to 192.168.255.255 | <input type="checkbox"/> d) 240.0.0.0 to 255.255.255.255 |
- 8** [2p] The IGMP protocol in the context of multicast routing:
- ☐ a) Only allows evaluation of a host’s membership in a multicast group.
 - ☒ b) Allows evaluating, adding, and removing hosts from a multicast group.
 - ☐ c) Enables flooding-based routing across the entire network.
 - ☐ d) All of the above are true, depending on the IGMP configuration.

- 9** [1p] MQTT, also known as Mosquitto, is used in the multicast environment to:
- ☒ a) MQTT is not known as Mosquitto, they are different things, and it is not multicast.
 - ☐ b) It is formally a multicast protocol used to transport telemetry data.
 - ☐ c) It is the lightest multicast method available for sending messages.
 - ☐ d) It is the only existing standard for sending telemetry data.
- 10** [2p] What is IGMP Snooping?
- ☐ a) It is an automatic interface blocking mechanism to prevent multicast frames from being sent.
 - ☐ b) Snooping is a multicast filtering protocol based on ICMP, not IGMP.
 - ☐ c) A multicast standard for IGMP packet load balancing.
 - ☒ d) It is a technique used by multicast switches to avoid propagating unnecessary traffic.
- 11** [2p] What is the size of IPv6 addresses?
- ☒ a) 16 bytes
 - ☐ b) 32 bytes
 - ☐ c) 64 bits
 - ☐ d) It depends on the transport protocol.
- 12** [2p] How does the checksum differ between IPv4 and IPv6?
- ☐ a) In IPv6 it applies to the entire datagram, not just the header.
 - ☐ b) In IPv6 it is a 32-bit field instead of 16 bits.
 - ☐ c) There is no difference; they have the same use and format.
 - ☒ d) The IPv6 header does not have this field.
- 13** [2p] Mark all devices that fragment IPv6 datagrams:
- ☐ a) Any router
 - ☐ b) Border routers
 - ☐ c) Switch
 - ☒ d) Sending node
 - ☐ e) Receiving node
- 14** [1p] What is the format for IPv6 broadcast addresses?
- ☐ a) Network address setting all host-id bits to 1.
 - ☒ b) There is no broadcast address, multicast groups are used.
 - ☐ c) There is no broadcast address, anycast addresses are used.
 - ☐ d) The broadcast addressing only makes sense in the link layer.
- 15** [1p] What are DNS AAAA records?
- ☐ a) Records that specify the authoritative name server.
 - ☐ b) Records that store IPv4 addresses.
 - ☒ c) Records that store IPv6 addresses.
 - ☐ d) Records that indicate the mail server name.
- 16** [1p] A network based on TCP/IP technology consisting of several distant LANs connected by leased lines that eventually use some service of the public Internet is a...
- ☐ a) intranet
 - ☒ b) extranet
 - ☒ c) hybrid network
 - ☐ d) VLAN

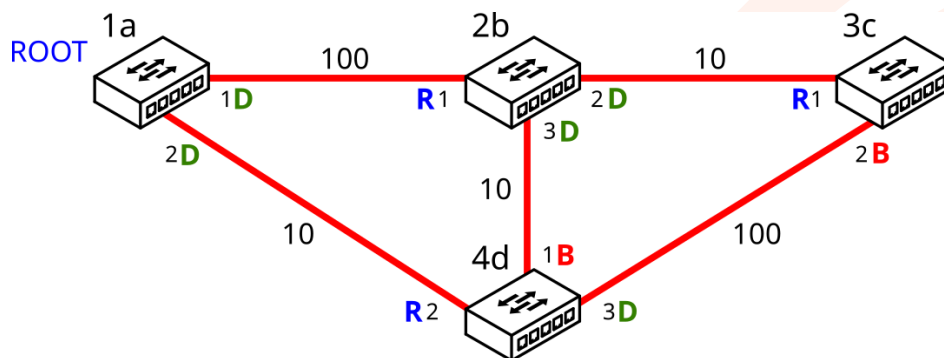
both are correct

A [8p] Considering the following NAT table, answer the questions:

Source IP	Source Port	Destination IP	Destination Port
192.168.1.7	2000	172.217.17.4	80
192.168.1.7	3000	172.217.17.4	80
192.168.1.5	2000	172.217.17.4	80
192.168.1.5	3000	172.217.17.4	80

- > **17** (2 points) Which is most likely the private IP address of the local router?
- ☒ a) 192.168.1.1 ☐ b) 192.168.0.1 ☐ c) 192.168.1.5 ☐ d) 172.217.17.4 ☐ e) 200.10.20.2
- > **18** (2 points) Which is most likely the public IP address of the local router?
- ☐ a) 192.168.0.1 ☐ b) 192.168.1.1 ☐ c) 192.168.1.5 ☐ d) 172.217.17.4 ☒ e) 200.10.20.2
- > **19** (2 points) Which type of NAT corresponds to the table?
- ☐ a) Basic NAT ☐ c) NAT with multiple public addresses
☒ b) NAPT ☐ d) NAPT with synthetic ports
- > **20** (2 points) What does the router do when it receives a packet with the following fields?
Source IP: 172.217.17.4, Source port: 80, Destination port: 2000
- ☐ a) The router delivers it to node 192.168.1.5.
☐ b) The router delivers it to node 192.168.1.7.
☐ c) The router delivers a copy to 192.168.1.5 and another to 192.168.1.7.
☒ d) The router discards it; the information is ambiguous.

B [8p] The following topology shows an Ethernet LAN made up of 4 switches and 6 segments. Each switch is labeled with its canonical address and the port number connected to each LAN segment. Use the format *switch.port* to name the ports, for example, E2.3 refers to *port 3 on switch E2*. Link speeds are shown in Mbps.



- > **21** (2p) Which switch is the root?
- ☒ a) 1a ☐ b) 2b ☐ c) 3c ☐ d) 4d
- > **22** (2p) Mark the root ports:
- ☐ a) 1a.1 ☒ c) 2b.1 ☐ e) 2b.3 ☐ g) 3c.2 ☒ i) 4d.2
☐ b) 1a.2 ☐ d) 2b.2 ☒ f) 3c.1 ☐ h) 4d.1 ☐ j) 4d.3
- > **23** (2p) Mark the designated ports:
- ☒ a) 1a.1 ☐ c) 2b.1 ☒ e) 2b.3 ☐ g) 3c.2 ☐ i) 4d.2
☒ b) 1a.2 ☒ d) 2b.2 ☐ f) 3c.1 ☐ h) 4d.1 ☒ j) 4d.3
- > **24** (2p) Mark the blocked ports:
- ☐ a) 1a.1 ☐ c) 2b.1 ☐ e) 2b.3 ☒ g) 3c.2 ☐ i) 4d.2
☐ b) 1a.2 ☐ d) 2b.2 ☐ f) 3c.1 ☒ h) 4d.1 ☐ j) 4d.3