

BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

COMPUTER NETWORKS

Thursday 28th March 2019 - Afternoon

Answer **any** FOUR questions out of SIX. All questions carry equal marks
Time: TWO hours

Answer any Section A questions you attempt in Answer Book A
Answer any Section B questions you attempt in Answer Book B

The marks given in brackets are **indicative** of the weight given to each part of the question.

Only non-programmable calculators are allowed in this examination.

Section A
Answer Section A questions in Answer Book A

A1. This question focuses on IPv6 Addressing.

- a) IPv6 Addresses have a distinct number of address types, i.e. global unicast, loopback, multicast, unique-local and link-local. Identify the address types for the following compressed IPv6 addresses:

- i. 2001:FF00:1:ACAD::FE55:6789:B210
- ii. ::1
- iii. FF00::997:AB12:F999:67C
- iv. FF02::9
- v. FC00:22:A:2::CD4:2001:76FA
- vi. 2033:DB8:1:1:22:FF01:259A:21FE
- vii. FE80::3201:CC01:65B1
- viii. FF00::

(8 marks)

- b) Using the standard rules of IPv6 address abbreviation, compress or decompress (as appropriate) the following IPv6 addresses:

- i. 2005:0EC0:0200:000a:0000:000B:4400:0802
- ii. FE80:0000:0000:000a:0000:6000:008E:9009
- iii. FE80::1234:ABC7:FACE:00FF
- iv. FF00::
- v. 2001:033:0001:1000:0000:330E:10C2:32BF

(5 marks)

- c) After executing the `ifconfig` command on a Linux workstation, the administrator observes the following output:

```
eth0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST>  
mtu 1500  
ether 3c:15:c2:e0:2d:24  
inet6 fe80::3e15:c2ff:fee0:2d24%en0 prefixlen 64 scopeid 0x4  
inet 10.249.98.1 netmask 0xffffe000 broadcast 10.249.127.255  
nd6 options=1<PERFORMNUD>  
media: autoselect  
status: active
```

- i. From the output above, the Linux workstation has been assigned an IPv6 address with a randomly generated interface ID. Explain what this allocation might indicate about the type of network the workstation is connected to.

As part of your answer indicate how the device might be obtaining the IPv6 address shown as well as the type of IPv6 address.

(6 marks)

- ii. Apart from the type of IPv6 address allocation shown above, explain the other four methods that an IPv6 address can be allocated.

(6 marks)

A2. This question is on Local Area Networks.

- a) Explain why the existence of active loops in Layer 2 Local Area Networks represents a problem.
(2 marks)
- b) Describe the types of problems that can occur when active loops are present in a Layer 2 Local Area Network.
(6 marks)
- c) What protocol-based standard is used by bridges and switches to prevent such loops from occurring in the first place and explain briefly how such solution works.
(8 marks)
- d) Explain why introducing solutions to loop prevention in Layer 2 networks can also cause a negative impact on network stability and performance. Indicate at least three enhancements made to improve network stability and performance in these scenarios.
(9 marks)

A3. This question is on Network Fundamentals.

- a) What typical network devices operate at the following layers of OSI 7 Layer Model?
 - i. Layer 1.
 - ii. Up to and including Layer 2.
 - iii. Up to and including Layer 3.
 - iv. Up to and including Layer 7.**(4 marks)**
- b) Indicate the Protocol Data Unit (PDU) used at each layer of the OSI Layer Model.
(7 marks)
- c) Explain the key differences between the OSI Layer model and the TCP/IP Reference model.
(5 marks)
- d) Describe how the processes of encapsulation/de-encapsulation work within the TCP/IP Reference Model. Expand your answer by using an example of a well-known protocol, such as HTTP, for an end to end conversation between a client and server (assume a direct connection between both devices).
(9 marks)

Section B
Answer Section B questions in Answer Book B

B4. This question is on Digital Communication.

- a) Given the following scenarios, indicate the recommended type of network medium, Layer 2 technologies and maximum transmission rates.
- i. A purpose-built office building with large open plan floors suitable for 500 fixed seating positions to accommodate both data and voice connections.
 - ii. A large research-based organisation involved into particle physics research with large data sets in needs to send between test sites in the same country but several hundred kilometres apart.
 - iii. A student house accommodating 6 students with their own laptops, desktops, tablets and phones which are used throughout the house. A conventional POTS connection is available at the property.

(15 marks)

- b) Describe the techniques by which broadband technologies such as Cable & xDSL can utilise a conventional local loop to offer both voice and data services to consumers. Mention should be made of the technologies that need to be present in both the consumers premises and at service providers premises to allow this to happen.

(6 marks)

- c) Explain and discuss the advantages and disadvantages of achieving confidentiality by using physical and wireless media for digital transmission.

(4 marks)

B5. This question is related to Wide Area Networks.

- a) Describe how flow control is handled in the following WAN protocols for issues such as congestion.
- i. Frame Relay.
 - ii. ATM.
 - iii. VPN.

(14 marks)

- b) Explain how techniques such as MPLS can be used on existing and future large-scale networks to improve packet delivery and routing efficiency. Use supporting diagrams to describe how MPLS can be overlaid on conventional networks to deliver the perceived benefits.

(11 marks)

B6. This question is related to Quality of Service.

- a) Compare and the contrast the use of QoS techniques Intserv and Diffserv applied to IP networks. In your discussion include:
- i. Advantages/disadvantages of Intserv. **(5 marks)**
 - ii. Advantages/disadvantages of DiffServ. **(5 marks)**

- iii. Differences between Intserv and DiffServ in the following QoS Services:
- a. Isolation.
 - b. Guarantee.
 - c. Service Scope.
 - d. Scalability.

(8 marks)

- b) Explain how QoS techniques, specifically Intserv and Diffserv, can be used to improve the network performance of real time and streaming protocols.

(7 marks)

END OF EXAMINATION PAPER