BCS Level 4 Certificate in Network and Digital Communications Theory Syllabus QAN 603/0703/1

Version 1.4
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This is a United Kingdom government regulated qualification which is administered and approved by one or more of the following: Ofqual, Qualification in Wales, CCEA or SQA.

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Contents

Change History

Any changes made to the syllabus shall be clearly documented with a change history log. This shall include the latest version number, date of the amendment and changes made. The purpose is to identify quickly what changes have been made.

Version Number	Changes Made
Version 1.0 October 2016	Syllabus Created
Version 1.1 November 2016	Ofqual number added 01/11/2016
Version 1.2 November 2016	Formatting and minor spelling corrections
Version 1.3 November 2016	Additional formatting and minor spelling corrections
Version 1.4 November 2016	Added mandatory Ofqual text

Introduction

This Certificate is the second of seven knowledge modules that are applicable to the Level 4 Cyber Security Technologist Apprenticeship. This is a general introduction to modern computer networks and not specific to Cyber Security. It covers the Network and Digital Communications Theory essentials.

Objectives

Apprentices should be able to demonstrate an understanding of modern computer networks. Key areas are:

1. Demonstrate the understanding and operation of commonly used network data and protocols.
2. Compare and contrast the features and functionality of layered network models.
3. Understand the functionality and operation of network routing.
4. Understand the factors that affect network performance.

Evidence of lessons learnt in these key areas should be collected and reflected upon when the apprentice is compiling the Summative Portfolio as the apprentice could identify how the task might be done better/differently with knowledge subsequently gained.

Target Audience

The certificate is relevant to anyone enrolled in the Level 4 Cyber Security Technologist Apprenticeship programme requiring an understanding of modern computer networks and digital communication theory.

Course Format and Duration

Apprentices can study for this certificate by attending a training course provided by a BCS accredited Training Provider. The estimated total qualification time for this Certificate is 124 hours.

Eligibility for the Examination

There are no specific pre-requisites for entry to the examination; however, apprentices should possess the appropriate level of knowledge to fulfil the objectives shown above. Individual employers will set the selection criteria, but this is likely to include A' Levels, a relevant Level 3 apprenticeship, or other relevant qualifications, relevant experience and/or an aptitude test with a focus on functional maths.

Duration and Format of the Examination

The format for the examination is a one-hour multiple-choice examination consisting of 40 questions. The examination is closed book (no materials can be taken into the examination room). The pass mark is 26/40 (65%).

Additional Time for Apprentices Requiring Reasonable Adjustments Due to a Disability

Apprentices may request additional time if they require reasonable adjustments. Please refer to the reasonable adjustments policy for detailed information on how and when to apply.

Additional Time for Apprentices Whose Language Is Not the Language of the Exam

If the examination is taken in a language that is not the apprentice's native/official language, then they are entitled to 25% extra time.

If the examination is taken in a language that is not the apprentice's native/official language, then they are entitled to use their own **paper** language dictionary (whose purpose is translation between the examination language and another national language) during the examination. Electronic versions of dictionaries will **not** be allowed into the examination room.

Guidelines for Training Providers

Each major subject heading in this syllabus is assigned an allocated time. The purpose of this is two-fold: firstly, to give both guidance on the relative proportion of time to be allocated to each section of an accredited course and an approximate minimum time for the teaching of each section; secondly, to guide the proportion of questions in the exam. Accredited Training Organisations may spend more time than is indicated and apprentices may spend more time again in reading and research. Courses do not have to follow the same order as the syllabus. Courses may be run as a single module or broken down into two or three smaller modules.

This syllabus is structured into sections relating to major subject headings and numbered with a single digit section number. Each section is allocated a minimum contact time for presentation. Apprentices should be encouraged to consider their Summative Portfolio throughout the modules.

Syllabus

For each top-level area of the syllabus, a percentage and K level is identified. The percentage is the exam coverage of that area and the K level identifies the maximum level of knowledge that may be examined for that area.

1. Network Data and Protocols (20%, K2)

In this key topic, the apprentice will describe and explain the common networks in use and their associated data formats, protocols and related performance issues. Outcomes should include an ability to:

1.1 Describe data formats and protocols in current use.

1.2 Explain features of network protocols in widespread use on the Internet. Including, but not limited to:

- HTTPS
- HTTP
- SMTP
- SNMP
- TCP
- UDP
- IP

1.3 Identify network failure modes and reasons why networks ‘hang’.

1.4 Describe approaches to error control in a network.

2. Layered Network Models (20%, K2)

In this key topic, the apprentice will be able to explain network layer models and then contrast their differences. Outcomes should include an ability to:

2.1 Explain features of the following layered network models:

- TCP/IP Reference Model
- OSI 7 Layer Model

2.2 Compare the differences between the following physical layer categories and datalink layer protocols:

- Physical Layers (including, but not limited to: Wireless, Fibre, Wired)
- Data Link Layer (including, but not limited to: Ethernet [802.3], Wireless LAN [802.11], Bluetooth)

3. Network Routing Protocols (30%, K3)

In this key topic, the apprentice will describe and explain network routing protocols. Outcomes should include an ability to:

3.1 Describe current network routing protocols in use; including, but not limited to:
- RIP/RIP2
- RIP-NG
- OSPF
- OSPFv2
- OSPFv3

3.2 Compare the differences between static and dynamic routing.

4. Network Performance (30%, K3)

In this key topic, the apprentice will describe and explain the factors that affect network performance. Outcomes should include an ability to:

4.1 Demonstrate the relationship between factors that affect network performance; including, but not limited to:
- Bandwidth
- Number of users
- Nature
- Contention

4.2 Explain methods of improving network performance; such as, but not limited to: traffic shaping and architecture.

Levels of Knowledge / SFIA Levels

This course will provide apprentices with the levels of difficulty / knowledge skill highlighted within the following table, enabling them to develop the skills to operate at the levels of responsibility indicated. The levels of knowledge and SFIA levels are explained on the website www.bcs.org/levels. The levels of knowledge above will enable apprentices to develop the following levels of skill to be able to operate at the following levels of responsibility (as defined within the SFIA framework) within their workplace:

Level	Levels of Knowledge	Levels of Skill and Responsibility (SFIA)
K7		Set strategy, inspire and mobilise
K6	Evaluate	Initiate and influence
K5	Synthesise	Ensure and advise
K4	Analyse	Enable
K3	Apply	Apply
K2	Understand	Assist
K1	Remember	Follow

Question Weighting

Syllabus Area	Target Number of Questions
1. Network and Data Protocols	8
2. Layered Network Models	8
3. Network Routing Protocols	12
4. Network Performance	12
Total	**40 Questions**

Format of Examination

Type	40 Question Multiple Choice.
Duration	1 Hour. An additional 15 minutes will be allowed for apprentices sitting the examination in a language that is not their native/mother tongue.
Pre-requisites	Accredited training is strongly recommended but is not a pre-requisite.
Supervised	Yes.
Open Book	No.
Pass Mark	26/40 (65%).
Calculators	Calculators cannot be used during this examination.
Total Qualification Time (TQT)	124 Hours.
Delivery	Online.

Trainer Criteria

Criteria	▪ Have 10 days' training experience or have a Train the Trainer qualification. ▪ Have a minimum of 3 years' practical experience in the subject area.

Classroom Size

Trainer to apprentice ratio	1:16