Making IT good for society

BCS Level 3 Award in Networking and Architecture Syllabus 603/0686/5

Version 2.0
September 2017

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

BCS Level 3 Award in Networking and Architecture

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 July 2016	Syllabus Created
Version 1.1 October 2016	Learning outcomes reformatted in some areas & content added.
Version 1.2 December 2016	Training criteria amended.
Version 1.3 December 2016	Compliance statement added.
Version 1.4	Module title corrected.
Version 2.0 September 2017	Major amendments following full review and changed TQT.

Introduction

This award is the first module of the five knowledge modules required for the Level 3 Infrastructure Technician Apprenticeship. It covers the range of concepts, approaches and techniques that are applicable to mobile and operating systems, for which apprentices are required to demonstrate their knowledge and understanding.

Objectives

Apprentices should be able to demonstrate knowledge and understanding of current operating systems and mobile devices. Key areas are:

1. Understand the use of a range of cabling and connectivity, the various types of antennas and wireless systems, and IT test equipment.
2. Understand maintenance processes and how to employ them in working practices.
3. Understand the fundamentals of computer configuration.
4. Understand the architecture of computer and business systems.
5. Understand the relevant numerical skills and the application of Binary, Octal and Hexadecimal notation.
6. Demonstrate the networking skills necessary to maintain a secure network.

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 award is relevant to anyone enrolled on the Level 3 Infrastructure Technician Apprenticeship programme.

Course Format and Duration

Candidates can study for this award by attending a training course provided by a BCS accredited training provider. The estimated total qualification time for this award is 98.5 hours.

Eligibility for the Examination

Individual employers will set the selection criteria, but this is likely to include 5 GCSEs (especially English, mathematics and a science or technology subject); other relevant qualifications and experience; or an aptitude test with a focus on IT skills.
Level 2 English and Maths will need to be achieved, if not already, prior to taking the endpoint assessment.

Format and Duration of the Examination

The format for the examination is a 1-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 Examination

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: first, 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; second, to guide the proportion of questions in the exam. Training providers 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.

Calculators

Candidates taking on-line examinations will have access to an on-screen calculator. No other calculators or mobile technology will be allowed.

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   Cabling and Connectivity (12.5%, K2)

In this topic, the apprentice will gain a working knowledge of a range of cabling and connectivity, the various types of antenna and wireless systems and IT test equipment. The successful apprentice should be able to:

1.1   Explain the key differences between cables and connector types.
- copper;
  - 10Base2;
  - xBaseT;
- fiber – glass / plastic;
  - multi-mode;
  - single-mode;
- connectors;
  - RJ45;
  - BNC;
  - Straight Tip (ST);
  - Subscriber Connector (SC);
  - Local Connector (LC).

1.2   Describe the key features of Cat1-6 cables.
- identify Cat1-4 cable as older types of cable;
- describe the main features of Cat5, 5A, 6, 6A;
  - capacity;
  - maximum distance;
  - network application;
    - 10BastT;
    - 100Base-TX;
    - 1000Base-T;
    - 10GBase-T.

1.3   Explain the different antennas types.
- directional;
- omni directional;
- point-to-point;
- point-to-multipoint;
- mobile.

1.4 Understand the types of wireless systems.
- Bluetooth;
  - o features;
    - ▪ radio communication;
    - ▪ medium range (1-10m);
  - o typical purpose;
    - ▪ wireless peripheral connection;
- Near-field communication (NFC);
  - o features;
    - ▪ radio communication;
    - ▪ very short range (6cm);
  - o typical purpose;
    - ▪ contactless payments;
- IrDA / IR;
  - o features;
    - ▪ uses infrared radiation;
    - ▪ typically short range communication (1-3m);
    - ▪ typically slow speed;
    - ▪ line of site;
  - o typical purpose;
    - ▪ communication link for older devices;
    - ▪ control TV / setup box remote controls;
- WiFi;
  - o features;
    - ▪ radio communication;
    - ▪ longer range (up to 100m);
    - ▪ faster;
  - o typical purpose;
    - ▪ wireless network for tablet / phones / computers;
- describe the key types of WiFi networking security;
  - o WEP;
  - o WPA;
  - o WPA2;
    - ▪ satellite;
  - o features;
    - ▪ typically uses a microwave link;
    - ▪ high latency;
    - ▪ expensive;
    - ▪ long range;
  - o typical purpose;
    - ▪ where other communication links not available.

1.5   Identify testing equipment used with wired and wireless networks.
- wired;
  - multimeter;
  - wire map tester;
  - cable testers;
  - tone generator and probe;
  - loopback plug;
- wireless;
  - wireless locator / WiFi analyser;
  - wireless heat maps.

2   Maintenance Processes (25%, K2)

In this topic area, the apprentice will understand maintenance processes and apply them in working practices. The successful apprentice should be able to:

2.1   Describe the typical information stored in maintenance work records.
- customer name;
- company name;
- system / device model and make;
- system ID / serial number;
- date;
- engineer name;
- description of maintenance activity;
- purpose of the maintenance activity;
- parts needed (if required).

2.2   Explain the purpose of maintenance work records.
- record of the work completed for customers;
- help with scheduling periodic routine maintenance;
- to improve quality of future maintenance work;
- identify trends that will help prevent future disruption.

2.3   Explain how to use fault related information and business process information / SLA to select the correct outcome considering.
- the priority of the fault;
- time the fault has been outstanding;
- any required escalation.

2.4   Explain the consideration required when undertaking a task given at short notice.
- ensuring task is recorded / logged in line with organisational guidelines;
- reprioritisation of all tasks in line with SLA's;
- potential business impact of undertaking / not undertaking short notice task.

2.5 Describe typical status sequences of maintenance tasks.
- open – initial recording of task;
  - customer details;
  - description of task;
  - time;
  - business impact;
  - system(s) impacted;
- pending – awaiting further input or information needed to progress;
- fixed – awaiting confirmation an issue is resolved;
- escalation – send the task to a more technically specialised team or more senior member of staff;
- closed - confirmed complete with documented diagnosis and fix.

2.6 Describe the purpose and use of the following maintenance tools when maintaining systems.
- systems backups;
- system event logging;
- antivirus;
  - software and antivirus pattern updates;
  - regular system scans;
  - monitoring of quarantined and uninfected items;
- general tools;
  - scheduling through Task Scheduler;
  - Windows Control Panel – services.

2.7 Describe the purpose of updates and how to manage updates for the following:
- system updates:
  - application updates;
  - system updates;
  - security patches;
  - Windows Server Update Service;
- firmware updates.

2.8 Describe how the following tools are used to manage local storage.
- monitoring disk space through drive properties;
- Check Disk (chkdsk);
- Disk Defragmentation;
- 'disk clean-up' utility;
- disk format;
  - FAT32;
  - NTFS.

2.9 Describe how the following tools are used to monitor system performance.
- Windows Event Viewer;
- Linux - /var/log/messages;
- Task Manager;
- Windows Resource Monitor;
- netstat -e;
- SMART monitoring tools.

3   Architecture (7.5%, K2)

In this topic area, the apprentice will understand and apply the basic elements and architecture of computer systems and business IT architecture. The successful apprentice should be able to:

3.1 Explain the features and purpose of basic computer systems components.
- CPU;
- motherboard;
- processor;
- memory;
- hard drive;
- NIC;
- power supply;
- fan.

3.2 Explain the purpose of:
- operating system – software used to manage the basic functions of a computer;
- applications – software designed to provide a specific task normally for end users;
- databases – used to storage and rapid retrieval of information;
- servers – provide systems resources that other computers can access;
  - o Active Directory;
  - o DNS;
  - o web proxy server;
  - o file and print;
  - o email;
  - o database;
  - o virtualisation;
- networking - provide managed communication links between computers;
- security – maintaining the integrity of systems and data;
- services – Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS).

4   Numerical Skills (17.5%, K3)

In this topic area, the apprentice will understand where to apply the relevant numerical skills. The successful apprentice should be able to:

4.1   Describe the configuration and use of:
- IPV4 address;
- netmask;
- default gateway;
- DNS server.

4.2   Describe key features of IPv6.
- much larger address space;
- 128 bits in size;
- 64 bits used for host address;
- 64 bits used for network address.

4.3   Identify which part of an IPv4 address refers to the network and which to the host.

4.4   Apply logical AND/OR on two 8 bit binary numbers.

4.5   Apply a binary to decimal conversion on binary numbers up to 8 bits in length.

4.6   Apply decimal to binary number conversion on decimal numbers up to 255.

5   Maintaining a Secure Network (37.5%, K2)

In this topic area, the apprentice will understand the relevant networking skills necessary to maintain a secure network. The successful apprentice should be able to:

5.1   Identify the purpose of types of data communication platforms used in networking.
- video;
  - typically requires more bandwidth than voice or data;
  - individual packets can be lost and communication still works but at reduced quality;
  - impacted by jitter;
- voice;
  - typically requires greater bandwidth than data less than video;
  - individual packets can be lost and communication still works but at reduced quality;
  - impacted by jitter;
- data;
  - typically requires less bandwidth than video or voice;
  - typically, a whole message must be received for the file to be uncorrupted.

5.2 Explain the settings needed to configure IP.
- IP address;
- netmask;
- default gateway;
- static / dynamic;
- public / private.

5.3 Explain the purpose of a DNS server.
- name resolution;
- storage of network records;
- CNAME;
- A.

5.4 Explain the purpose of configuring the IP address of DNS server on a client.
- enables DNS name resolution.

5.5 Explain how to create and configure virtual networks.
- VLAN;
- VPN;
- virtualised switch.

5.6 Describe how to configure and support networks by editing key settings.
- IP address / netmask / default gateway;
- primary and secondary DNS;
- firewall enabling / disabling;
  - the entire firewall;
  - ports;
    - dhcp;
    - dns;
    - ftp;
    - http;
    - https;
    - imap;
    - pop3;
    - RDP;
    - smtp;
    - ssh;
    - telnet;
  - applications.

5.7   Explain the main configuration tools, what their functions are and how they are used to maintain security.
- personal firewall;
- perimeter firewall;
- directory services (Active Directory);
  - users;
  - groups;
- policies (group policy);
  - password policies;
  - hardware restrictions;
  - application and utility restrictions.

5.8   Describe how to configure remote support of systems using:
- RDP;
- VNC;
- SSH.

5.9   Describe the key purposes of domain controllers.
- centralise the management of directory services;
- centralise the management of security policies;

5.10 Describe the major steps required to install a domain controller.
- install Windows Server;
- configure networking;
- install Active Directory;
- configure a domain name.

5.11 Describe the purpose of creating and managing users and computer records within Active Directory:
- users – centralised management of user access to organisational network;
- computers – centralised management of which computer can access a domain and domain resources.

5.12 Describe how to create, update and delete within Active Directory.
- organisational unit (OU);
- users;
- computers.

Levels of Knowledge / SFIA Levels

This syllabus 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. Cabling and Connectivity	5
2. Maintenance Processes	10
3. Architecture	3
4. Numerical Skills	7
5. Maintaining a Secure Network	15
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	Training from a BCS accredited training provider is strongly recommended but is not a pre-requisite.
Supervised	Yes.
Open Book	No.
Pass Mark	26/40 (65%).
Calculators	Calculators may be used during this examination.
Total Qualification Time (TQT)	98.5 Hours, 37.5 GLH recommended.
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