Mark Scheme (Results)

June 2012

GCE Applied ICT (6959/01)
Communications & Networks

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the world's leading learning company. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information, please visit our website at www.edexcel.com.

Our website subject pages hold useful resources, support material and live feeds from our subject advisors giving you access to a portal of information. If you have any subject specific questions about this specification that require the help of a subject specialist, you may find our Ask The Expert email service helpful.

www.edexcel.com/contactus

Pearson: helping people progress, everywhere
Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.

- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.

- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.

- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Activity 1 — Network management

Question Number	Indicative Content
Note: Place student in correct mark band based on content. QWC adjustment can only reduce mark within band. This must be based on the expectation within the mark band. Marks cannot be added and the adjustment cannot put the mark in a different mark band.	
1 QWC*	A briefing document for Richard about the suitability of a FON system Written in non-technical language. i.e. NOT paragraphs from Wikipedia or the FON website. Includes one or more diagrams that help the explanation. e.g. signal coverage, split between public / private parts of the system. Set in the context of the White Hart hotel / Poacher's Pantry. Legal aspects: • (Data) security requirements for customers • ISP terms and conditions, may / may not allow connection sharing. • ISP business contract may be needed • liability for customer uploads / downloads, e.g. possible illegal activities. Equipment requirements: • Suitable wifi router /access point, FON enabled. e.g Fontanera / BT Homehub or similar • enough bandwidth to split public / private. i.e. reliable high capacity Internet connection to the router Ability to cover the required areas: • consideration given to positioning the WAP(s). Need to cover Poacher's Pantry and garden area as a minimum • consideration of range. Signal may be usable on the road, therefore non-patrons may use it. Customers' signals may be intercepted. (security) Security • May also be covered under legal aspects and / or coverage • built in cut-out between public and private part of FON • hardware / software for cut-out provided by FON • normal network security measures must be applied. Conclusions. There is no right or wrong answer, the credit is for reasons supporting the candidate's conclusion. e.g. YES. Because established, reliable technology. Public area can be covered with single FON router sited at the garden end of the Poacher's Pantry, preferably by a window. FON system keeps track of user IDs so any illegal activity is traceable, or at least deniable by Richard and Anne. NO, Because ISP may not allow it / may want a more expensive, commercial contract. Equipment is only available from limited sources so may mean a tie-in to a more expensive solution to the problem. Could be

problems with people using the system for hacking / spamming / illegal music downloads. Have a user ID system does not necessarily mean people won't try to sue.

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-4	Document is not in non-technical language. (less than 33%) Material is not in the context of the scenario. Notes cover at least two topics with at least two sensible statements about each OR a suitable explanatory diagram. Conclusion but no reason. The candidate uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.
Level 2	5-8	Document is partly in non-technical language. (over 33%) Material is mainly in the context of the scenario. Notes cover at least three topics with at least two sensible statements about each OR a suitable explanatory diagram. Conclusion but only simple reasons. e.g. too expensive, too difficult to manage, lots of people use it, no problems with it. The candidate uses some terms and shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.
Level 3	9-12	Document is mainly in non-technical language. (over 67%) Material is all in the context of the scenario. Notes cover all four topics with at least two sensible statements about each OR a suitable explanatory diagram. Conclusion with at least two good reasons along the lines of the indicative content, or other convincing and appropriate reasons. The candidate uses a range of appropriate terms and shows good focus and organisation. Spelling, punctuation and the rules of grammar used with considerable accuracy.

Activity 2 – Network management, planning

Question Number	Answer	Mark
2 (a) (i)	Required evidence for 2 (a) (i). The cheapest possible solution for a meeting room. 1 mark for a sensible item and cost to a maximum of 6 marks Answers may include:	

Requirement	Item	Cost
Cable	Cat 5e. 305m reel between the 10 rooms. NOT pre-made leads	£70 for 12
RJ45 ends	Bulk pack of 100, between the 12 rooms. Basic ends, no boot. NOT pre-made leads	£5 to £10 for 12
RJ45 cables	Bulk purchase cables	£75 for 50
Data connection device and Wifi connection	Simple 4 – 5 port switch. Combined with WAP – allow both items separately for one mark total	£50 - 75
Data projector	VGA with 800 x 600 resolution, (networked by attaching to a networked PC with remote desktop capability)	£200 - 300
Sound system	Large, around 5 – 15 Watt, PC speakers (attached to a networked PC with remote desktop capability)	£30 - 40
Interactive whiteboard	IR adapter for plain whiteboard OR use of Wii Remote and Bluetooth connection plus software, eg smoothboard	£300 – 350 Wii Remote, Bluetooth and software e.g. smoothboard. £80 - £100
Computer	Basic netbook	£100 - 150

6

2 (a) (ii)	Required evidence for 2 (a) (ii)			

Required evidence for 2 (a) (ii)

A solution with a budget of £3000 or less

1 mark for a sensible item and cost
1 or 2 marks per item for plausible justifications to do with obsolescence / lifespan / value to the hotel (e.g. customer satisfaction)
to a maximum of 10 marks
Answers may include:

Item	Cost	Justification
Cat 6e cable	£100 for 12	Long, multi-year, life. Good bandwidth which should give a reasonable length of future-proofing
RJ45 ends with boots	£55 for 12	Long, multi-year, life. Boots will help protect them, reducing maintenance / replacement costs
High Quality, combined WAP, switch / router with remote admin function. Management system + WAPs	£500 for 12 + £100 - 125	Should last several years, less chance of obsolescence with firmware upgrades. Remote admin will allow configuration changes without handling the hardware, therefore less wear and tear.
Networked, wifi link, projector or high end projector	£800-900	Buying a new model now should give several years life. No cables to attach / detach so less handling. Less handling = longer bulb life. Can be e.g. ceiling mounted to reduce accidental damage risk. Easier for customers to link to. Consideration or better picture.
Networked, high quality, e.g. surround sound, system with remote admin. WiFi	£200 - 250	Long, multi-year, life. Remote admin allows more flexibility. Not likely to become obsolete for a long time as it is not strictly an I.T. device.
Interactive whiteboard or similar. Fixed device. Multi-user, multi-interaction methods	£1200 - 1500	Long, multi-year, life. Less chance of obsolescence with firmware / software upgrades. Better quality board should be more reliable and give greater customer satisfaction
Laptop / PC / top end netbook	£300 - 400	Most obsolescence prone part of the system. Could argue for 1 good machine per room to improve performance of the rest of the devices Could argue for better quality gives customer satisfaction if rest of

11

		improvements are within budget.	
	1 mark given for £3000 or less.		

2 (b)	**Required evidence for 2b** a method of achieving network segment separation / communication 1 mark for each plausible statement to a maximum of 5 marks Answers may include: Managed switches can be (remotely) split into two or more virtual switches. (1) Connections can be (remotely) assigned to a virtual switch (1) No overlap except through the (controlled) server connection (1) WAPs can be (remotely) managed to allow MAC addressing (1) Wifi connections can therefore be limited to known computers / computers in the room (1) Therefore computers in adjacent rooms cannot get around the network separation by logging on to a different network's wifi (1) Split server into 2 or more virtual servers (1) Sub divide network addresses into subnets (1) Each virtual server / subnet can have it's own domain / section of the network (1) Only PCs authorised for that domain / section will be able to communicate with each other (1)	
		5
	TOTAL FOR ACTIVITY 2	**22**

Activity 3 – Network components

Questi on Numbe r	Answer	Mark
3	Reasons must be given in context.	

Component	Reason	Notes
PCs 3/4	Reception, Richard, Anne. As specified. May have 4th PC for operating the server.	Assume monitors, keyboards, etc. are included.
Black and white printer	Specified for reception	Ink-jet or mono laser, no network requirement.
Server	Specified	Probably needs to be a dedicated server, not a PC running server software.
Backup server / device	Backup is essential for a business setting such as the hotel.	Could be a second server / hot swappable drives with server image / other suitable device to enable fast recovery.
Main Switch	Cable connections required by scenario for most areas	Minimum 16 port if subsidiary switches are used in each main area. 48 if everything runs from one switch.
Small switches / switch-routers	Used to reduce cable runs from main switch, give more flexibility in each area.	5 or 8 ports would do in most areas. Meeting room floors may have further switches for each room.

Answer continues on next page

Component	Reason	Notes
Router-modem	To provide an internet connection	Probably a combined device. Candidate may assume this is supplied by ISP and not give details.
Colour laser printer, networked	For Richard and Anne. Networked as both need to use it.	Must be duplex and reasonably heavy duty, 2000 duplex per day.
WAP / Wifi router x 15 - 25	All areas used by business customers must have wifi cover	Number depends on assumptions made about siting, range, etc.
Cable, 2 x 305m box	Cable connections required by scenario for most areas	Could be given as individual lengths. Should add up to at least 400m.
Patch leads x 50+ RJ45 ends x 100 + OR made up leads specified	Required in meeting rooms etc. to connect to data points.	Needs 50 + leads / 100+ RJ45s for stated connections plus 3 per meeting room, could be more. Accept any plausible number over 50 / 100
Data sockets x 20+	Specified as required in meeting rooms etc.	Minimum of 20 needed for required connections. Probably more, depending on how small switches are used.
Other sensible device	With context specific reason	May include: patch panels, trunking conduit, hardware firewall, cabinets, external antenna / WAPs. Accept up to 4 devices for 1 mark each.

| | TOTAL FOR ACTIVITY 3 | **14** |

Activity 4 — Network design

Question Number	Answer	Mark
4 (a)	Required evidence for 4a: **a network design for the complete project** a) diagram shows network links to: garden area, Poacher's Pantry, lounge, reception, I.T. office, ground floor conference hall, first floor conference hall, owner's apartment, bedrooms floor, meeting rooms floors, restaurant b) cable type(s) shown c) ISP's device / connection d) reception PC with B&W printer e) server in IT office. Plus backup system / server in sensible location f) main switch in sensible location g) subsidiary switches in sensible locations, e.g. one per area in (a) h) sensible link from server to main switch i) sensible link from server to router for Internet connection j) direct link from router to Internet k) cable connections to 2 conference halls and 10 meeting rooms. Meeting rooms may be shown as 2 x floor of rooms l) wifi connections for 2 conference halls and 10 meeting rooms. Meeting rooms may be shown as 2 x floor of rooms m) projector, whiteboard and sound system in one example meeting room. n) computer in one example meeting room o) projector, whiteboard and sound system networked or linked to computer p) WAP in example meeting room q) owner's apartment, 2 x PC and networked colour laser printer r) WAPs arranged to cover all areas in (a). Accept any plausible layout. s) wifi link to new dining area and bar / other plausible method t) wifi converted to data point / switch for POS in dining area and bar u) credit card base units. 2 in Poacher's Pantry / garden area, 1 in reception	**18**

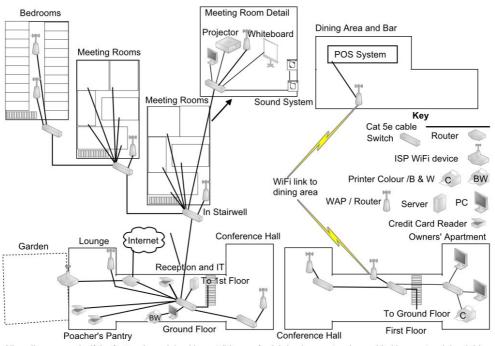| 4 (b)	Required evidence for 4b:	
	notes justifying each major decision made with regard to the network design.	
	There are no marks for descriptions of what is on the diagram.	
	1 mark per explanation which justifies a decision, to a maximum of 6.	
	Answers may include:	
	• backup system position	
	• type of backup system	
	• router position	
	• network protection	
	• number of switches	
	• switch position	
	• wifi provision	
	• links to dining area and bar	
	• provision for expansion	
	Network Diagram.	
	NOTE.This diagram:	
	a) is **not** the only answer	
	b) is probably not the best answer	
	c) is drawn to illustrate all of the marking points	
	Allow diagram marks if the feature is explained in part (b). e.g. for (e), backup system is provided by a network hard drive.	
	Network Diagram. NOTE. This diagram:	
	• Is not the only answer	
	• Is probably not the best answer	
	• Is drawn to illustrate all the marking points	6
	TOTAL FOR ACTIVITY 4	24

Activity 5 – Network protocols

Question Number	Answer	Mark
5 (a)(i)	**Required evidence for 5a:** Document for Richard, describing two methods of operating the server remotely from his PC. Answer should be fit for purpose, non-technical. Maximum of 4 marks per method, i.e. 3 + 3 OR 4+2 1 mark for each relevant factual statement about a usable method. To a maximum of 6 marks. Answers may include: Method 1 - Client – server system. - The network server runs client remote control software - Client software runs as a service / autoruns on startup / is always on - PC runs server version of remote control software - Server version pings / detects clients when run, displays all clients - PC user / Richard can view / take over the network server by selecting the client in the server version of the remote control software - Allows interaction between Richard and user on network server Method 2 - Remote login system. - The network server runs an network OS or application that allows remote login over a network / LAN - PC has the same software - At logon, a network address /computer name can be selected instead of the user's PC - Remote logon requires no-one is logged on to the server and / or remote logon must be allowed to forcibly log off current server user - Does not allow interaction between Richard and user on network server	6
5 (a)(ii)	**Required evidence for 5b:** State, with reasons, which method would be most suitable There are no marks for the choice. Award 1 mark for each plausible, scenario-related reason. To a maximum of 2 marks. Answers may include: For a client-server system. - Always on, so does not require a new application to start - can interact with someone at the server - can view without having to take over For a remote logon system - only runs when needed, more secure	2

		• only runs when needed, less resources used • facility already exists in some operating systems, no new software needed	

5 (b)	**Required evidence for 5c:**
	A document for Richard that describes **one** method of operating the server remotely from his laptop
	1 mark for each relevant factual statement about a usable method.
	To a maximum of 4 marks.
	
	Answers may include:
	Client – server system / VPN (LogMeIn)
	   • network server 'listens' for activity on a known port number
	   • laptop runs client version of the software
	   • laptop sends ID information to known port number
	   • server and client software establish VPN connection / tunnel
	   • laptop can perform remote logon (as described in (b))
		4

5 (c)	**Required evidence for 5d:**
	a document for Richard that explains the role of the router in making the connection
	1 mark for each relevant factual statement about router functions.
	To a maximum of 4 marks.
	Answers may include:
	   • Router shows public address to the Internet
	   • VPN client needs to use public address
	   • Router monitors the port being used by the software
	   • Router sends data arriving at the port to a private network address / the server address
	   • Uses network address translation (NAT) function to do this
	   • Reverses the process when server sends to client
		4

	TOTAL FOR ACTIVITY 5	**16**

SWW	**All printouts must have a header and footer. The header must contain the activity number. The footer must contain your name, candidate number and centre number.** **Minimum font size of 10 should be used for all word processed documents.** **Submitted work must meet the page limitations given in each activity.**	**2**

	TOTAL FOR PAPER	**90**

Ofqual

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

cea
Rewarding Learning

6959
1206