edexcel

Mark Scheme (Results)

Summer 2016

Pearson Edexcel GCE
in Applied ICT (6959)

Unit 9: Communications and Networks

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. 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

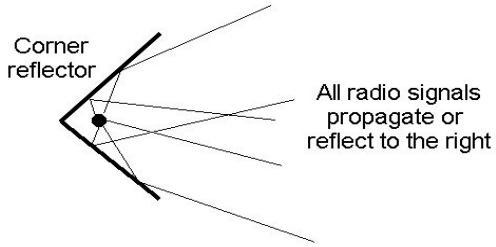
Summer 2016
Publications Code 6959_01_1606_MS

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.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

  i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear
  ii) select and use a form and style of writing appropriate to purpose and to complex subject matter
  iii) organise information clearly and coherently, using specialist vocabulary when appropriate.

Activity 1 - Network design.

Question Number	Answer	Mark
1	(a) (i) WiFi antenna position A diagram produced by the candidate, showing how positioning affects coverage (1) A technical explanation of how positioning affects coverage (1) An extension to the explanation (1) e.g.  Wall absorbs / blocks / reflects signal. 360 signal now 180 signal / only propagates to the right / not detectable from the left	3
	(ii) WiFi antenna design A diagram produced by the candidate, showing how design affects coverage (1) A technical explanation of how design affects coverage (1) An extension to the explanation (1) e.g.  Antenna reflects signals into a quadrant / defined area. Area depends on angle of the corner **NOTE.** Allow any directional antenna type. e.g. dish, yagi-uda	3
	(a) (iii) Recommend with reasons, antenna types and locations for the moorings area. There are no marks for the recommendations, award marks only for reasons. The best answer is a directional antenna, attached at first floor height, on the wall of the chandlery / offices facing the moorings. Accept other answers with plausible reasons. Do not allow omni-directional antenna. Give one mark per plausible, scenario-related reason to a maximum of 4 marks. Max of 3 marks for type, max of 3 marks for location Reasons may include:	**4**

	• Directional type to allow tailored coverage of moorings / prevent signal reaching other areas • Directional type to give increased range / cover all moorings with a single antenna • Type, cost argument • Height / position to prevent accidental / deliberate damage • Position to reduce cable length required • Position to allow easy access for maintenance • Position on harbour wall to give weak / no signal on land side / in Chora	
	(a) (iv) Describe the hardware and software changes / additions that will need to be made. Hardware. A proxy server, or upgrade / replacement of ISP router (1) To allow / handle the number of connections (1) Software. Hotspot / traffic management software (allow named)(1) To limit users by time / bandwidth (1)	**4**
1(b)	(b) A document that discusses the relative costs of a fully WiFi solution and a WiFi plus cable solution There is no 'best' solution and no marks for recommendations. Award a maximum of 6 marks for a **cost-related** discussion, which may include: • list of WiFi devices / cable needed (1) • justification of WiFi devices (1) • justification of cable requirements (1) • estimate of installation costs, labour / time etc. (1) • consideration of ongoing costs, e.g. maintenance (1) • detailed budget for fully WiFi (1) • detailed budget for cable plus WiFi (1)	**6** **(20)**

Activity 2 – Research, network design and benefits of networks.

Question Number	Indicative Content
2(a)	**A report for Katerina on tablet based packages which meet her requirements for a self guided sailing tour.** 1. **be easy to use, requiring the minimum of training for new users** 2. **be able to communicate cheaply, with no additional devices required** 3. **be able to work out where it is so that it will provide relevant information** 4. **allow video, so that e.g. navigation settings can be shown and checked** 5. **contain guide material for each port and any sights to be seen while at sea** 6. **be resistant to knocks, drops and other accidents that are likely to occur** **Easy to use** • uses common GUI based OS, e.g Windows, Linux • software components have clear shortcuts / means of launch • software components have common / similar layouts / ways of working **Able to communicate cheaply** • has WiFi capability • has 3G / cell phone capability **Be able to work out where it is** • has GPS capability • has 3G / cell phone capability with location system **Allow video** • has web cam • has video link software • software has pre-set for link to the marina **Contains guide material** • maps • tourist information and guides • local information such as shops and facilities • map – information integration / overlays • a copy of The Odyssey • video clips / photos of sights from the sea **Be resistant to knocks, drops and other accidents** • rugged case, proof against knocks and drops • screen protector

	• waterproof and floats **Other considerations** • price • ability to run multiple tasks • availability • total cost of ownership, e.g maintenance, software upgrades and licenses, insurance, expected lifetime.

Level	Mark	Descriptor
	0	No rewardable material
1	**1-4**	A limited response such as: An outline of the package, covering at least three of the requirements. May mention extra components but little detail. May give factually incorrect statements about the capabilities of the hardware and / or software. May not link requirements to package components. The candidate uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.
2	**5-8**	A detailed response such as: A description of the package, covering at least four of the requirements. Will show some awareness of the limitations of the hardware or software available Will link requirements to extra components. The candidate uses some terms and shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.
3	**9-12**	A comprehensive response such as: A description of the package, covering all of the requirements. Will show some awareness of the limitations of the hardware and software available Will link requirements to extra components and write the report in the context of the scenario. The candidate uses a range of appropriate terms and shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.

Activity 3 - Components of a network - (suggested time 2 hours)

Question Number	Answer	Mark
3	A table detailing the hardware and cabling components for the system, with reasons. **Must** have quantity **and** reason in context. 1 mark per component, 1 mark per sensible reason. To a maximum of 18 marks**.** Existing equipment e.g. PCs, NAS, printers, only get marks if functions are added / changed.	**(18)**

Component	Qty	Reason	Notes
Existing PCs in office and chandlery	3	Look for additional functions, e.g. Administering WAPs, Running proxy server, Administering tablets Running video links to boats Traffic management	Each new / additional purpose can be awarded a mark. Assume monitors, keyboards, etc. are included.
New PCs	1+	As above	As above
Server / extra NAS	1+	For video on demand and games For network administration. For e.g. proxy server, device admin, video links	Needs to be capable of running multiple instances. i.e. a server, not a PC. Each new / additional purpose can be awarded a mark
Backup system	1	Replacement for / addition to present system	Needs to be an improvement on Win 8 backup software
Printer	3	Look for replacement of inkjet / mono laser for a sensible reason	Needs to be to a better / business grade printer
Router-modem (cable)	1	Internet connection, provided by ISP. Could have a second line added for improved bandwidth	Must be in addition to existing router
WAP	8+	Look for coverage of the apartments, sailing school and some outside areas. Existing WAPs are in chandlery, offices, taverna	Number depends on location of devices and coverage Needs at least five extra
Specialist antenna	1+	To give coverage of the moorings	May also be used to cover e.g. grounds around apartments
Switch	1+	Existing ISP switch only has 5 ports. Look for larger switch / multiple small switches	Large switch should be a business grade item Switch(es) must have fibre port(s) where fibre is used.

Fibre optic cable	Any	To make links e.g. from offices to apartments.	Accept any sensible use. Quantity should be sensible for stated use. Could be given as individual lengths.
Twisted pair cable	Any	To make links e.g. from offices to apartments.	Accept any sensible use including patch leads. Quantity should be sensible for stated use. Could be given as individual lengths.
RJ 45 ends	Any	To connect cables to PCs / waps, etc.	Should be 2 per cable. Accept included as made leads.
Other sensible cable type	Any	To connect non-standard devices to the network	May include: leads to specialist antenna, TV connections Accept up to 2 cable types for 1 mark each.
Other sensible network hardware	Any	May include: UPS, patch panels, cabinets, data sockets, trunking	Accept up to 3 devices for 1 mark each.
Award 1 mark for any attempt at keeping to a budget of £5000 (showing a total)			

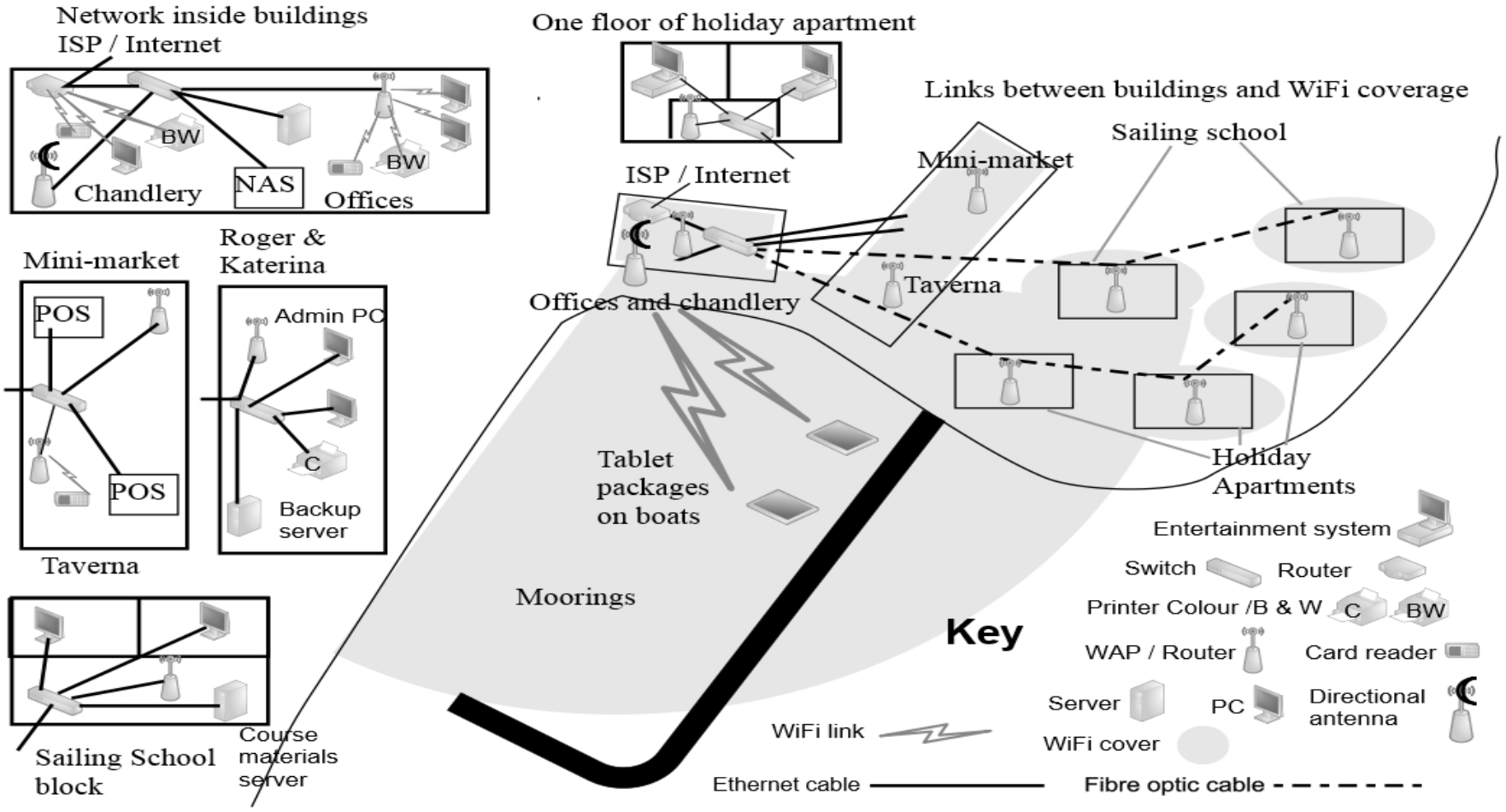
Total for Activity 3 - 18 marks

Activity 4 — Network Design

Question Number	Answer	Mark
4(a)	**A network design for the complete project** a) diagram shows at least: moorings, chandlery / offices, taverna / mini-market, apartment blocks. (must be obvious) b) location of sailing school shown c) cable types shown d) links from office / main switch to all areas, everything shown is connected. e) WiFi coverage of moorings shown f) WiFi coverage of apartments and sailing school shown g) WiFi coverage of offices / chandlery, taverna and waterside area shown h) WiFi coverage of other areas of marina shown i) indication of restricting coverage to the marina area j) office, ISP router and Internet k) office, extra switch / improved router l) office, PC and printer m) chandlery, PC and printer n) office, chandlery and taverna, credit card reader in either o) taverna and mini-market, PoS system p) Roger and Katerina's apartment shown q) Roger and Katerina's PC, printer and WAP r) sailing school, internal network linking bedrooms to course materials server s) apartments, entertainment system t) server in sensible location u) server linked to router. Direct or via one switch. v) NAS in sensible location w) backup system / storage in sensible location x) WAP locations shown y) extra PCs, as detailed in Activity 3 z) indication of tablet connection Max 18 marks	**(18)**

Network Diagram follows on the next page.
NOTE. This diagram:

- is **not** the only answer
- is probably not the best answer
- is drawn to illustrate all of the marking points


Network inside buildings
ISP / Internet
BW
BW
Chandlery
NAS
Offices
Mini-market
Roger &
Katerina
POS
Admin PC
POS
C
Backup
server
Taverna
Sailing School
block
Course
materials
server
One floor of holiday apartment
ISP / Internet
Offices and chandlery
Links between buildings and WiFi coverage
Mini-market
Sailing school
Taverna
Tablet
packages
on boats
Moorings
Holiday
Apartments
Key
Entertainment system
Switch
Router
Printer Colour /B & W
C
BW
WAP / Router
Card reader
Server
PC
Directional
antenna
WiFi cover
WiFi link
Ethernet cable
Fibre optic cable

6959_01
1606

Question Number	Answer	Mark
4(b)	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 10. eg. I have used a directional antenna on the chandlery = 0 I have used a directional antenna on the chandlery so as to cover the length of the moorings = 1 Answers may include justifications of: • location of sailing school • WiFi coverage of key buildings • WiFi coverage of other areas • methods of keeping WiFi coverage inside the marina • type of backup system • internet connection upgrades • network protection, e.g. cabinets, position WAPs out of reach of visitors • number and position of switches • cable types, twisted pair v fibre • link types WiFi v cable • provision for expansion	**(10)**

Total for Activity 4 - 28 marks

Activity 5 – Components of a network and connectivity

Question Number	Answer	Mark
5(a)	An explanation of Network Address Translation 1 mark for each relevant factual statement in context. Answers may include any 3 of: • maps public IP to private IP / JRM IP (1) • private (JRM) address hosts the VNC software (1) • public IP fixed / allocated by ISP (1) • private IP must be static (1) Do not award a mark for 'links to VNC' or similar without detail.	**3**

Question Number	Answer	Mark
5(b)	Describe, **in order**, the sequence of events that take place when Gregor or Maria successfully connect to a device on the JRM network. 1 mark for each relevant factual statement, **in order**, to a maximum of 7 marks. Answers may include: • Gregor / Maria run VNC client software on their PC (1) • client software sends request / signal to public IP of router / JRM (1) • client software sends request to known / specified port for NAT (1) • NAT service recognises request and accepts the connection (1) • NAT uses port forwarding to connect VNC client to device running VNC server (1) • VNC server recognises signal and starts login / connection routine (1) • Gregor / Maria log in to VNC server • select required device using VNC server • VNC server connects to device • Gregor / Maria log in / assume control of device	**7**

Total for Activity 5 – 10 marks

Standard ways of working. 2 Marks EE

All printouts must have a header and a 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.

Total for Paper – 90 marks