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Mark Scheme (Results)

Summer 2011

GCE Applied ICT (6959)
Communications and Networks

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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	Answer	MAX
Activity 1	Network components and design	

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.

Indicative content

A set of illustrated notes for Hishima

Cantenna / waveguide	
Dish	
Corner reflector	

For each antenna type notes should have:

- a diagram
- a simple description of how it works
- simple figures for range and coverage
- sizes. e.g. can diameter & length, bowl diameter & depth, box length & height

Notes should contain:

- a comparison of range and coverage of the three types
- a recommendation with a justification.

Dimensions

The ideas given here are only examples of what candidates may produce. The marks are for putting **their** research findings into a simple and understandable form.

For a cantenna or corner reflector:

- sizes related to wavelength/ frequency

e.g. about 25 cm = half wavelength at 2.4Ghz (accept candidate's research figures)

- cantenna length / CR dipole should be exact fraction / multiple of wavelength

For a dish:

- need for parabolic section to get tight beam

does not need to be a complete dish

- focal length/diameter (f/D)should be about .5 (accept candidate's research figures)
- transmitter-receiver should be at focus

For either:

- Polarisation of signal / orientation of antenna affecting signal.

Activity	Answer		MAX
Level	**Mark**	**Descriptor**	
	0	No rewardable material.	
Level 1	1-4	Notes have simple diagrams with little or no text. Or have text but no diagrams. Reason for choice is simple e.g. cheap / easy Little or no technical detail 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	Notes have a diagram for at least the chosen antennae that illustrate some technical detail. The text refers to the differences between the types. Reason for choice has some detail for one factor e.g. cost of materials Technical detail given but it is incomplete 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	Notes with diagrams for the three antennae types that illustrate some technical detail. The text clearly explains the difference between them. Reason for choice has detail for more than one factor e.g. cost of material / ease of obtaining the material Complete technical detail given for the chosen type (indicates top of level 3) 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 topology and connectivity	
Required evidence for 2a, b, c, d: FAQs explaining the WiFi mesh to Hishima. The material must be in the context of the scenario		
2 (a)	**What is meant by mesh WiFi?** Accept any **WiFi** device - does not have to be laptop Any 5 of: • a suitable diagram of a mesh (Note: use Google images and enter MESH NETWORK. Check for copy and paste of images) Credit if seen anywhere in question 2. (1) • each laptop is a node / access point (1) • all laptops can signal to all other laptops in range (1) • signals can follow many possible routes (1) • loss of a node or route should not 'break' the mesh / stop communications (1) • storage / Internet access / peripherals shared by whole mesh (1) • no need for central control / server, laptops will work peer to peer (1) Maximum 5 marks	**(5)**
2 (b)	**What features of the XO laptops have been designed for the purpose of forming and using the mesh?** Any 5 of (needs feature and use): • dual antenna, to boost the range (1) • software for automatic connection to a mesh, saves setup problems (1) • laptops act as routers, to forward packets automatically (1) • WiFi antenna stays on even if laptop is off, keeps the connection / mesh working 24 / 7 (1) • WiFi antenna has its own (low power) processor / named processor, for use when laptop main processor is off (1) • dedicated key on keyboard, allows user a quick view of the mesh and who is online (1) • software will detect network assets automatically (1) Maximum 5 marks	**(5)**
2 (c)	**What is the expected performance of the mesh?** Any two points relating to **speed and distance**: • 2Mbit/s (Could be higher if justified / explained) (1) • 2 to 3 times normal WiFi range / 200 to 300 metres between laptops (1) Other reasonable figures with a justification of uprated equipment are acceptable Maximum 2 marks	**(2)**

2 (d)	**What will limit the performance of the mesh and what effects will be seen?** Any two of (needs factor and effect): • number of machines in the mesh, more = slower (1) • distance from server / Internet access point, further = slower (1) • battery life, dead battery = dead node / may break the mesh / may cause choke points (1) • may be problems with school buildings masking signals (1) Maximum 2 marks	**(2)**
	TOTAL FOR ACTIVITY 2	**14**

<table>
<tr><td>Activity 3</td><td colspan="2">Components of a network</td></tr>
<tr><td></td><td colspan="2">Evidence for 3a to 3g.
An explanatory paragraph for each of the items a to g.
2 marks for each of a to g.
Amount plus where = 1 mark
Reason in context = 1 mark
If an item is rejected, award up to 2 marks for a good reason in context.
Allow different numbers if reason justifies.</td></tr>
<tr><td>3 (a)</td><td><table>
<tr><td>Item</td><td>two 305m reels of CAT6 cable</td><td rowspan="3">Amount will vary with network layout. 1 box should be enough but allow 2 if there are a lot of data sockets, e.g. one per classroom</td></tr>
<tr><td>Amount
Where</td><td>1 box
joining Toshiba, WAPs, data sockets to switch (1)</td></tr>
<tr><td>Reason</td><td>cable faster than mesh so use where devices have ethernet ports (1)</td></tr>
</table></td><td>(2)</td></tr>
<tr><td>3 (b)</td><td><table>
<tr><td>Item</td><td>six packs of 50 RJ45 connectors</td><td rowspan="3">Amount will vary with network layout. 1 pack should be enough.
1 per data socket
2 per WAP, + Toshiba</td></tr>
<tr><td>Amount
Where</td><td>1 pack
to terminate ethernet cables (1)</td></tr>
<tr><td>Reason</td><td>allows connection to devices with ports (1)</td></tr>
</table></td><td>(2)</td></tr>
<tr><td>3 (c)</td><td><table>
<tr><td>Item</td><td>a box of data sockets with assorted faceplates</td><td rowspan="3">Amount will vary with network layout.
Allow anything sensible</td></tr>
<tr><td>Amount
Where</td><td>could run all cables direct to a switch but will probably want 1 - 7+
1 per classroom, 1 for staff block (1)</td></tr>
<tr><td>Reason</td><td>allows Toshiba to be moved to e.g. classroom for faster printing (1)</td></tr>
</table></td><td>(2)</td></tr>
</table>

3 (d)

Item	a box of unmanaged switches 10 x Netgear FS605 and 6 x Netgear FS608	type used will depend on layout Probably FS605 (5 port) for clinic FS608(8 port) for school, depending on how many connections need to be made. May need to be 2 x FS608 if extra data points and WAPs used
Amount Where	2+ type used will depend on layout Probably FS605 (5 port)for clinic FS608(8 port) for school, depending clinic and school, near connecting wifi link (1)	
Reason	need to allow wifi link to be used by several devices (1)	

(2)

3 (e)

Item	a box of wireless access points 10 x Netgear WN802T-200UKS Rangemax Next	Number used will depend on layout. Must have 1 but may use more in the school. 1 in each classroom acceptable Should not be used outside of the school / clinic
Amount Where	1 in the school. May also be in school grounds (1) (already one in the clinic)	
Reason	Must have 1 for the mesh/laptops in the school May have extra in school / clinic to improve connectivity. (1)	

(2)

3 (f)

Item	a Toshiba Tecra R10-11B laptop	Reason needs to include storage, this is the only device with a hard drive. Printing is likely to be controlled by the Toshiba as well
Amount Where	only 1 available staff block (office or anywhere else in staff area) but could be occasionally moved (1)	
Reason	network storage & print server(1)	

(2)

3 (g)

Item	two HP Deskjet D2660 inkjet printers	These can only connect via USB so cannot be networked. Printing would probably be via the Toshiba, both for control and to save having to load drivers onto the laptops
Amount Where	1 or 2 mainly with the Toshiba but could be moved (1)	
Reason	Printing, using USB / connected to Toshiba (1)	

(2)

TOTAL FOR ACTIVITY 3 **14**

Activity 4	Network Design	
4 (a)	Required evidence for 4a: **a network design for the complete project** a) cable types identified (1) b) link from school to clinic (1) c) correct antenna at each end of link from school to clinic (1) d) switch in clinic, connected to WAP / link (1) e) laptop(s) in clinic (1) f) original WAP in clinic (connection to laptops) (1) g) link from clinic to outside business / Internet (cable) (1) h) switch in school, connected to WAP / link (1) i) Toshiba laptop in school staff block (1) j) printer connected to Toshiba laptop by USB (1) k) data socket locations /cable runs (1) l) XO laptop(s) in school (1) m) XO laptop(s) in home / surrounding area (1) n) diagram indicates a mesh network (1) o) extra WAP /printer / switch in a sensible location or for a justified reason (1) Max 13 marks	**(13)**
4 (b) **E** **CCC** **AA**	Required evidence for 4b: **an explanation and justification of decisions made regarding the positioning of network devices and equipment.** 1 mark per explanation which justifies a decision, to a maximum of 6. There are no marks for descriptions of what is on the diagram. Answers may include: • Toshiba laptop position • data socket positions • switch size • switch position • WAP positions • network protection / security measures • expansion provision • economical use of assets e.g. • Toshiba laptop in the workshop = 0 • Toshiba laptop in the workshop so that Hishima can do maintenance without disturbing the headteacher / staff = 1 • 5 port switch used in clinic = 0 • 5 port switch used in clinic as there are only 2 WAPs and the Internet connection to be plugged in, so an 8 port switch would be a waste = 1	**(6)**
	TOTAL FOR ACTIVITY 4	**19**

Activity 5	Network addressing and protocols	
Required evidence for 5a: **Notes for Hishima.**		
5 (a) (i)	**DHCP and how it will help.** Any 5 of: • uses a DHCP server (1) • allocation of IP addresses (1) • addresses given a lease / 'lifetime' (1) • easy to add new machines (1) • saves manual setup time (1) • any other sensible answer (1) Maximum 5 marks	**(5)**
5 (a) (ii)	**Private Class C:** Any 2 of • 255 addresses (1) • doesn't show outside the network / internal control of IPs (1) • all use same public address / use router to communicate to Internet / words to that effect (1) Maximum 2 marks	**(2)**
5 (a) (iii)	**Scope** Any 2 of: • block / range of IPs / numbers within Class C range (1) • used to make groups of computers etc/ can have multiple scopes (1) • allows policies to be set for each group (1) Maximum 2 marks	**(2)**
5 (a) (iv)	**Reservation:** • fixed / static IP given to one device (1) • used where IP should not change (from day to day) (1) Maximum 2 marks	**(2)**
5 (b) (i)	Required evidence for 5b: **Answers to TanCel's questions about scopes and reservations, with reasons. Should the scopes be different and why.** Any 3 of: • Yes, should be different for school and clinic (1) • allows security policy / settings on clinic laptops (1) • because medical records etc. should not be accessible by school (1) • because school records etc should not be accessible by the clinic (1) • makes it easier to see which devices are in different parts of the network (1). Maximum 3 marks	**(3)**

5 (b) (ii)	Any 3 reasons from: • for remote admin via web page (1) • need a static IP address (1) • need fixed location for network printing / storage (1) • any other sensible reason for having a static IP address. Maximum 3 marks	**(3)**
	TOTAL FOR ACTIVITY 5	**17**

Activity 6	Network management	
6	Required evidence for 6a: **guidance notes for Hishima on network management tasks.** **NOTE.** The marks are for guidance notes for the tasks, in context. **There are no marks for task names without notes.** Award 1 mark for each of 6 the named tasks that have been put into the context of the scenario. Award one mark for each of 6 named tasks with sensible / plausible guidance notes. The following tasks are identified in the specification. • System configuration. • User support. • User management. • Usage monitoring. • Misuse monitoring. • Fault finding. • Allocating passwords and access levels. • Backup procedures. • Security procedures such as anti virus and firewall configuration. • Contingency planning. • Strategic long-term planning. • Software licensing. • Formulating a network code of practice. • Server management. • Managing updates. • Centralised software rollout. • User training. • Supervision and management of network staff • Advising on purchasing. • Writing policy documents and reports to management. • Legislation. Maximum 12 marks	**(12)**
	TOTAL FOR ACTIVITY 6	**12**

SWW **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.**	**2**

	TOTAL FOR PAPER	**90**

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