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Mark Scheme (Results)

January 2013

GCE Applied ICT (6959)
Unit 9: Communication 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 1 – Research. Network Architecture.

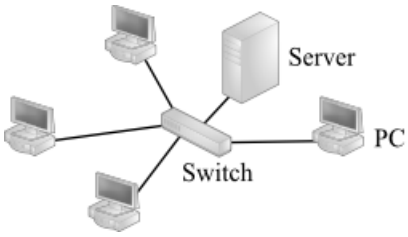
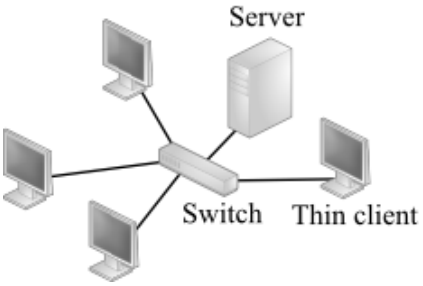
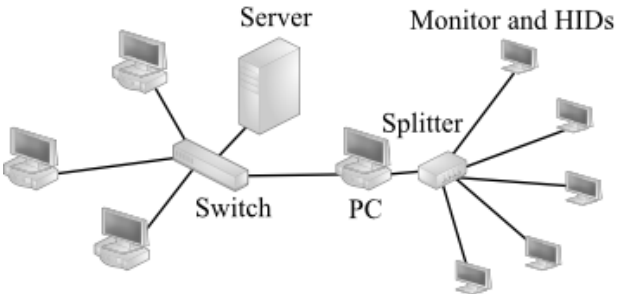
Question Number	Answer	Mark
1 (a)	Required evidence for 1(a). A set of notes for Alan explaining the role of virtualization in creating multiple emulations on one computer. **Any 3 from:** • Virtualization can be hardware or software based. (1) • Creation of a virtual machine which is independent of / isolated from the host machine OS (1) • Each virtual machine can host / run an emulation (of an early computer) (1) • Multiple virtual machines managed by a control programme / hypervisor / virtual machine monitor (1) • Virtual machines share host machine's resources (1) • Any additional technically correct response. (1)	**(3)**

Question Number	Answer	Mark
1(b)	Required evidence for 1(b), a document for Alan giving appropriate information on file recovery **1 mark per point to a maximum of 6** **Maximum of 4 for audio tape, maximum of 4 for discs** **For cassette audio tapes.** **1 mark per point to a maximum of 4** **Hardware** • Cassette tape reader (1) • Audio cable, connecting audio out (headphone) on tape reader (1) • To audio in (microphone) on PC sound card (1) **Software** • Specialist manipulation programme, e.g. TAPER, MAKEUEF (1) • To produce the tape image / a useable file (1) **For floppy discs.** **1 mark per point to a maximum of 4** • Some early computers, eg Atari, Amiga, can write in PC format (1)	

	• Therefore load old format into a working machine and write to PC. (1) • Use a software floppy disc controller that can read old formats. eg. Adfread (1) • Run a virtual machine of old computer, use it to access disc drive / files (1) • Some early computers could be networked through Ethernet / null modem cable.(1) • Drive contents can be read over the network (1)	**(6)**

Question Number	Answer	Mark
1(c)	Required evidence for 1(c), a document for Alan giving appropriate information on legal issues **Legal implications of downloading abandonware files.** **1 mark per point to a maximum of 6** **Stated cases.** **Has original media** • Legal (in context) unless backup copy forbidden by license (1) **Has original media but the original file is corrupted** • Legal (in context) unless backup copy forbidden by license (1) If forbidden, probably still legal to use the file to rewrite original media (1) **Has packaging and documentation but the original media has been lost** • Illegal (piracy) without permission from copyright holder (1) **General** • Exemptions to DMCA etc. to allow museums / libraries / archives to change media / remove DRM / format shift, etc. (1) • Depends on original license / EULA (1) • Early licenses often allowed / recommended / did not forbid, making backup copies (1) • Floppy discs / tapes unreliable / easily corrupted, so licenses recommended using a copy rather than original (1) • No concept of games being playable on different makes of computer, so not forbidden (1) • Depends on copyright status of abandonware file (1) • It may have been released as freeware, shareware, commercially (1) • Copyright may have passed to a company which has closed, with no traceable copyright owner existing. (1) • Downloading still technically breaches copyright but protection would be unenforceable. (1) • Abandonware sites have (often) obtained permission from copyright holders / software companies (1)	**(6)**

Activity 2 - Network connectivity.

Question Number	Indicative Content
2	Indicative content. A document for Alan describing the architecture, benefits and drawbacks of each solution. **Solution 1**  **Note**. Must have server, switch and at least 2 PCs for a diagram to be suitable. Labels may be on diagram or in text. Diagram labelled or described as: • Star topology. • Fat / thick client system (contrasting with thin client solution) **Solution 2**  **Note.** Must not be the same diagram as solution 1. Must have server, switch and at least 2 Clients for a diagram to be suitable Labels may be on diagram or in text. Diagram labelled or described as: • Star topology. • Has a larger / more capable server than solution 1. **Solution 3**  **Note**. Must have link from network, PC, splitter /control box and at least 3 clients for a diagram to be suitable Labels may be on diagram or in text. Diagram labelled or described as star of stars topology. Function of splitter / reverse KVM switch described

	An explanation of benefits and drawbacks Answers may include: **Solution 1** *Benefits* • Simple to set up, just needs an emulator on each machine • Can run on low specification systems • Easy to maintain, just swap out faulty machines • No single point of failure *Drawbacks* • Needs a PC for each game / station **Solution 2** *Benefits* • Simple to set up, everything runs from server / software is maintained on the server • Easy to maintain because: o faulty client machines can be swapped out o virtual servers (assuming software based) are easy to make / administer *Drawbacks* • Single point of failure, power loss to server stops everything • Possibly an expensive solution as: o it will need a good server / set of servers to run 30 virtual machines o lower cost of thin clients may not offset the server price **Solution 3** *Benefits* • Possibly a cheap solution because: o screens, keyboards, etc. are cheaper than PCs and / or thin clients o Modern PCs have a lot of resources (compared to early machines) so one can run several clients from one PC • Easy to maintain, just swap out faulty machines *Drawbacks* • Single point of failure, 5 stations go down if one PC fails • Harder to maintain than solution 1 because: i. splitter / extension cables are extra items of hardware ii. splitter software is an extra layer of complexity **iii.** splitter SW is only made by a few companies **Do not allow statements about:** • security issues. eg public hacking into games, theft of items • safety issues. eg having lots of cables laying around, movability / stability of hardware • MS Windows. The scenario states that this a Linux based system.

Level	Mark	Descriptor
0	0	No rewardable material.
1	1-4	Document refers to all three solutions but only gives detail for one or two. Diagrams are unlabelled and / or incomplete. Network architectures are named but not described Document address benefits **or** drawbacks of at least two solutions 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	Document refers to and gives detail for all three solutions. Diagrams are labelled but incomplete. Network architectures are named but not all are described Document address benefits **or** drawbacks of all three solutions **OR** Document address benefits **and** drawbacks of of at least two solutions 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	Document refers to and gives detail for all three solutions. Diagrams are labelled and complete. Network architectures are named and described Document address benefits **and** drawbacks of of all three solutions. 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 3 - Components of a network.

Question Number	Answer	Mark
3(a)	Required evidence for 3a: an estimate for each solution. Award 1 mark for an appropriate server and 1 mark for the client bundle for each solution. Allow sensible plus or minus on each cost Ignore any hardware other than server and client bundle **Solution 1** Low end server/high end PC: £500 (1) 30 refurbished low end PC bundles with monitors are available for around £100 each (1) (Total cost £3500) **Solution 2** Low end server: £1000 (1) Refurbished thin clients are available for around £100 each. = £3000 30 x monitor. Refurbished are around £50 each = £1500 Keyboards are around £7.50 each = £225 (1) (Total cost £5725) **Solution 3** Low end server/high end PC: £500(1) 6 x PC, recommended dual core. Refurbished PC bundles with monitors are available for around £250 each. = £1500 30 x monitor. Refurbished are around £50 each = £1500 Keyboards are around £7.50 each = £225 Splitters are around £50 per station = £1500 (1) (Total cost £4725) All three solutions clearly shown to be under £6000 e.g. by showing totals (1)	**(7)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>3 (b)(i)</td><td>Required evidence for 3b, a table for Alan which identifies the purpose, quantity and cost of each component.
1 mark per component. Max 8
Needs to be in context. Allow different numbers if reason justifies.
Costs are approximate. Allow anything sensible and within budget.
<table>
<tr><th>Component</th><th>Quantity</th><th>Purpose</th><th>Cost</th><th>Notes</th></tr>
<tr><td>30 PCs with screens etc. Plus a server</td><td>30 + 1</td><td>In scenario</td><td>As in 3(a)</td><td>Allow mention, detail marked in 3(a)</td></tr>
<tr><td>Switch</td><td>1 to 6</td><td>for linking</td><td>600</td><td>probably 5 * 8 port
but could be one large one</td></tr>
<tr><td>Ethernet cable Cat 5 or better</td><td>200 m / 1 box</td><td>links server, switches, PCs, etc.</td><td>100</td><td>could be lots of specified lead lengths. Must add to > = 200m</td></tr>
<tr><td>RJ 45 ends</td><td>pack of 200</td><td>need 2 per cable / patch lead</td><td>10</td><td>min 70 if only one switch</td></tr>
<tr><td>Data sockets</td><td>32</td><td>outlets for each PC / client and workshop</td><td>200</td><td>could use more. eg on existing hardware</td></tr>
<tr><td>Patch leads</td><td>30 to 40</td><td>data socket to PC etc.</td><td>30 to 40</td><td>Could be made from extra cable and RJ45 ends. Allow mark if stated</td></tr>
<tr><td>Other sensible hardware item X 2</td><td>makes sense</td><td>sensible reason</td><td>makes sense</td><td>eg cabinet, patch panel, UPS, backup system</td></tr>
<tr><td>Linux OS</td><td>as needed</td><td>In scenario</td><td>free</td><td>Accept generic Linux or any Linux distribution</td></tr>
<tr><td>Emulation software</td><td>as needed</td><td>In scenario</td><td>usually free</td><td>accept generic or any named emulator</td></tr>
</table></td><td>(8)</td></tr>
</table>

Question Number	Answer	Mark
3 (b)(ii)	All items being costed and within the £7000 budget (1)	**(1)**

Activity 4 – Network Design

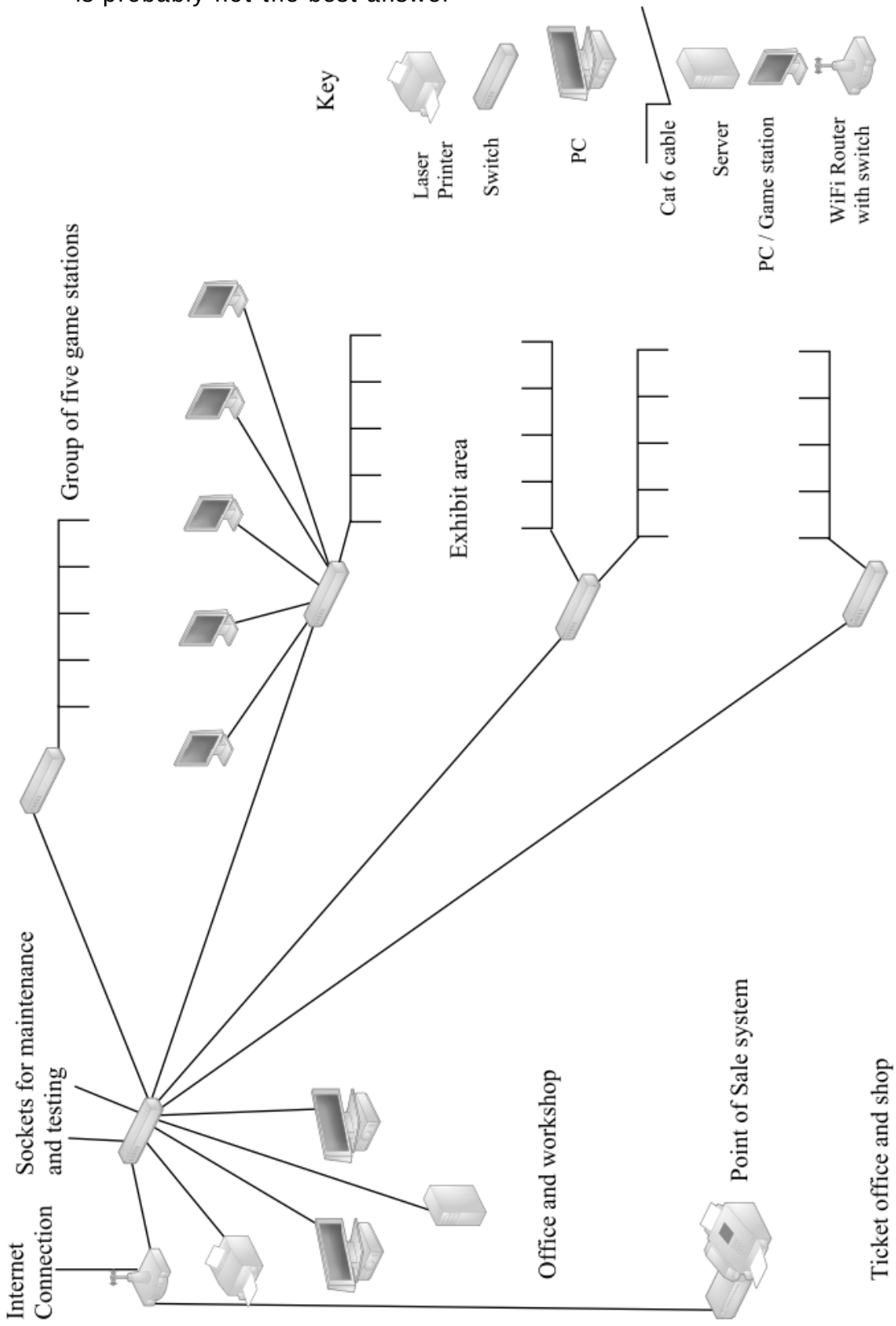
Question Number	Answer	Mark
4(a)	Required evidence for 4a, network design for the complete project **Max 13 marks from:** Diagram shows: a) exhibition area, shop and ticket office, office and workshop (accept any sensible description) b) cable type identified (min 5e) c) one group of 5 game stations in detail d) 5 other groups of game stations as label / box or similar e) server f) main switch near server g) switches for each game station group h) 2 PCs in office workshop i) networked printer in office j) point of sale system in shop k) WiFi router with switch in office l) Internet connection from Wifi Router m) 2 x connections / data points in office workshop for testing n) short (one switch) link from one PC to server o) short (one switch) link from server to router	**(13)**

Question Number	Answer	Mark
4b	Required evidence for 4b, An explanation and justification of decisions made regarding the positioning of network devices and equipment. Answers may include discussion of: • server position • switch sizes • switch positions • printer location • network protection / security measures • expansion provision • use made of the pre-existing router - switch • WiFi provision • game station grouping / locations • budget considerations 1 mark per explanation which justifies selection, use or positioning of network devices and equipment to a maximum of 6. There are no marks for descriptions of what is on the	

	diagram. e.g. The server is in the office and workshop = 0 The server is in the office and workshop as it is a secure area/ so that routine maintenance is easier/ so that it near to the controlling PC = 1	**(6)**

Network Diagram. NOTE. This diagram:

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



Activity 5 – Network addressing and protocols

Question Number	Answer	Mark
5a	Required evidence, a set of 5 cards, in context, explaining the TCP/IP model ● For a set of 5 cards. Award 1 mark for each point to a maximum of 20 marks ● For a set of 4 cards. Award 1 mark for each point to a maximum of 17 marks ● For a set of 3 or less cards. Award 1 mark for each point to a maximum of 14 marks **Note. Layer names and functions are from Requirements for Internet Hosts -- Communication Layers. RFC1122. Variations on layer names are acceptable provided it is clear what they are and they have the correct functions.** Overall points: a) language is at an appropriate level for museum visitors For a set of three or more cards b) looks like a set of display cards. eg. Not just plain text, uses large font, has consistent layout / graphic / logo / exhibit title c) context stated / clear from wording over the whole set d) context is appropriate for the exhibit and maintained for whole set e) concept of encapsulation where data gets extra 'wrappings' in each layer f) suitable common graphic. eg. 4 layer stack diagram **Card 1, Overview of TCP/IP model.** 1a. CP/IP means Transmission control protocol / Internet protocol 1b. way of splitting up a communication system / process 1c. made of 4 layers, where a layer is a function / set of functions within the process 1d. layers communicate with / talk to / layers above and below 1e. ppropriate diagram showing overall structure	

Card 2, Application layer

2a.
deals with user data / passes high score to TCP IP stack

2b.
uses suitable protocol / uses standard API

2c.
establishes socket

2d.
appropriate diagram or graphic. eg of web page / data entry process

Card 3, Transport layer

3a.
deals with communication between network hosts

3b.
uses suitable protocol, probably TCP or UDP in this scenario

3c.
high score held in datagram with addressing detail

3d.
provides error correction / high score held in datagram with checking details

3e.
appropriate diagram or graphic. eg. of PC joined to router to remote PC / host, two joined networks

Card 4, Internet layer

4a.
a deals with sending data / datagrams across network boundaries

4b.
deals with addressing and routing

4c.
establishes networking over the Internet

4d.
encapsulates datagram into Internet datagram / adds more routing / address information

4e.
uses suitable protocol, probably IP in this scenario

4f.
appropriate diagram or graphic. eg. router to remote router, IP address structure

Card 5, Link layer

5a.
deals with local network links

5b.
no router involved

5c.
includes network card / network card drivers

5d.

	forms link from specific hardware on PC to hardware independent part of the model 5e. sends the high score packet along the ethernet cable 5f. appropriate diagram or graphic. eg. network card converting data into packets	**(20)**

Question Number	Answer	Mark
5(b)(i)	Required evidence for 5b, advice on the DHCP problem. Award 1 mark for each point to a maximum of 2 • The most likely cause is having two DHCP servers running • The router was running / serving DHCP for the old system • Both DHCP servers had the same / an overlapping scope	**(2)**

Question Number	Answer	Mark
5(b)(ii)	Award 1 mark for each point to a maximum of 3 • Leases were in place / current when the join was made • The leases did not expire until a few days after the join • The problem only showed up when a PC asked for a new lease	**(2)**

Question Number	Answer	Mark
5(b)(iii)	Award 1 mark for each point to a maximum of 2 1. Switch off DHCP on the router 2. Reset / release problem PCs' IPs 3. Restart the problem PCs Allow for one mark, change the scopes or change the subnet masks to 255.255.0.0	**(2)**

EE

Standard ways of working. 2 Marks

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.

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