Mark Scheme (Results)

Summer 2010

GCE

GCE Applied Information and Communication Technology

(6959/01) Unit 9 – Communications and Networks

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Publications Code UA023490

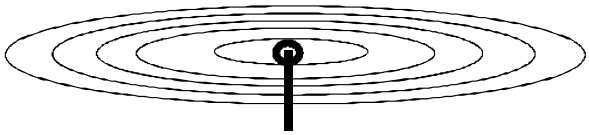
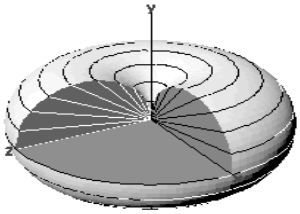
General Marking Guidance

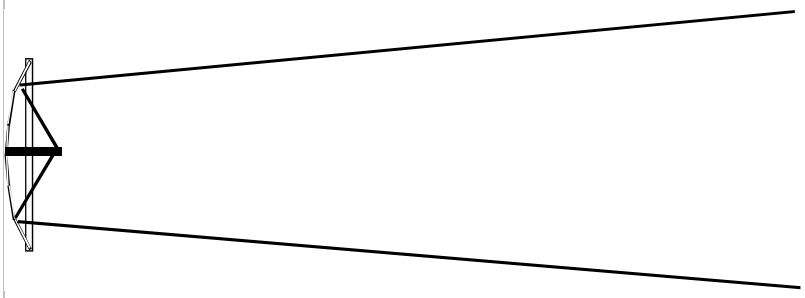
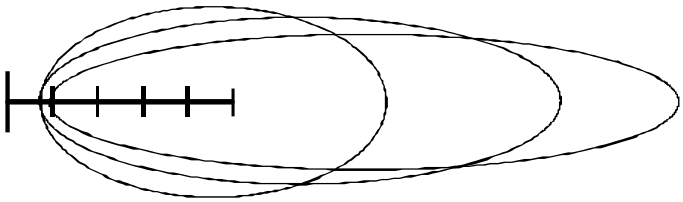
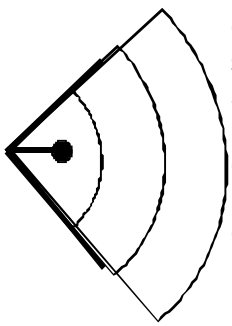
- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should 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.

Applied GCE Unit 9 – Mark Scheme			
Activity	**Answer**	**Poss. Mark**	**Max**
Activity 1	**Network management**		
	Indicative content: A set of instructions for the management staff to follow.		
	It should be written as a set of step-by-step instructions. Instructions may include: On server / migrate server and on each PC change permissions / ownership if needed find user profiles / profiles$ / profiles directory / NTuser.dat search for databases spreadsheets documents other specified. e.g. scripts, favourites, outlook express. second other specified save copies to specified external storage make disc images of each drive		
	Indicative content: brief notes for Viro, explaining two different methods of preventing data recovery. Recommending which method he should use. Explaining the reason for the recommendation		
	Methods of preventing data recovery. Answers may include: Software method, e.g. Destroy IT, Kremlin, Low level format tool. These overwrite the data with patterns of 1s and 0s, using multiple overwrites to increase security. **OR** Low level format tool. Writes zeros to every address. **NOTE.** True LLF is a factory only process. Encryption. Use a strong encryption key to scramble the disk contents. Key must not have been stored on the disk itself / key must be overwritten to destroy it. Degaussing. Uses a strong magnetic field to remove all data removes low level formatting making disk inoperable Physical methods. e.g. breaking, heating, grinding damages the disk surface to make data unreadable Must be applied carefully as any undamaged surface may still contain readable data.		

Applied GCE Unit 9 – Mark Scheme				
Activity		**Answer**	**Poss. Mark**	**Max**
		NOT delete / format without evidence of understanding of the limitations of this approach. **Possible recommendations and reasons** Software / Encryption. Fast and cheap but secure against casual attempts to read data. Can be done in-house Degaussing. Very secure, but not as fast as other methods as disk would need to be low level formatted OR not as cheap, as disk would need to be replaced before sale. Physical destruction. Most secure if done correctly but not as cheap as other methods. It needs a new disk in order to sell computer as working. Can be done in-house.		
QWC				
Level	Mark	Descriptor		
Level 0	0	No rewardable material.		
Level 1	1-4	Instructions are not a step by step guide or are too generalised or are not appropriate for non-specialists. Covers server **OR** computers as a whole. Notes on preventing data recovery are mainly unedited from original source, with little attempt to make it understandable for non-specialists. Recommendation 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	Instructions are written as a step by step guide but are not appropriate for non-specialists. **OR** written so that non-specialists can understand but not a step by step set of instructions. Covers server **OR** computers as a whole. Notes on preventing data recovery give an explanation of two methods of destroying data. There is an attempt to write in non-technical language. Recommendation with brief reason. (cheap, fast, easy) The candidate uses some terms and shows some focus and organisation.		

Applied GCE Unit 9 – Mark Scheme				
Activity		**Answer**	**Poss. Mark**	**Max**
		Spelling, punctuation and the rules of grammar are used with some accuracy.		
Level 3	9-12	Instructions are written as a step by step guide that non-specialists can understand. Covers server **and** PCs or PCs very well done Notes on preventing data recovery are written in non-technical language and give a good explanation of two methods of destroying data. Recommendation with well-explained reason. 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 connectivity.**		
(a)		Notes to explain what dBi, dBm, and mW are, and how they relate to each other		
		Any 8 points from: • **dBi** (= isotropic decibels) / **power gain relative to an isotropic antenna /** antenna that radiates in all directions (1) • 3 dBi increase is approx a doubling of power / the greater the dBi, the higher the gain (1) • so increasing dBi increases range / any reasonable calculated example (1) • **dBm** (= decibels referenced to a milliwatt (mW)) **used to measure power** (radiated / transmitted) (1) • 3 dBm increase is approx a doubling of power / the greater the dBm, the higher the power (1) • 0 dBm = 1 mW (1) • so 3 dBm = 2 mW … 6 dBm = 4 mW … 20 dBm = 100 mW / any reasonable example (1) • **mW** (milliwatt / = 1/1000 Watt) **a measure of power** (1) • 1 Watt = 1 joule per second / 1 mW = 1/1000 joule per second (1) • Power radiated by antenna dBm = power of transmitter (device generating signal) (1) • + antenna gain dBi (1)	**8**	

Applied GCE Unit 9 – Mark Scheme			
Activity	**Answer**	**Poss. Mark**	**Max**
	• - losses in the system, e.g. in cables (1) • Reference to European standards (1) **Content does not need to be under headings for marks to be awarded** 8x1		
b (i) (ii)	Diagrams showing a standard isotropic wifi antenna and **two** other wifi antenna types, notes describing how each antenna type affects signal coverage **NOTE.** The diagrams show different methods of indicating the radiation pattern from antennae. Any understandable method, including a text description, is acceptable. Must have isotropic plus 2 others **For each antenna type.** Diagram 1 mark. Note about coverage 1 mark  Isotropic.  **Isotropic.** Radiates equal power / energy / strength in all directions. Radiation pattern is a sphere but also shown as a disc (as signal from transmitter to receiver will be in a plane). **OR** pattern is shown as a sphere but acts as a disc (for single transmitter receiver link). Has shortest range / 100m because power must be spread over whole sphere / disc / 360 degrees. Has 360 degree coverage / equal coverage in all directions		

Applied GCE Unit 9 – Mark Scheme			
Activity	**Answer**	**Poss. Mark**	**Max**
	Parabolic/ dish  Radiates in a (conical) beam so power is increased in that direction. Beam can be tight focus but is then difficult to align Usually covers around 60 degrees for easier setup Range increase depends on beam spread / sensible figures or calculation.  Yagi. / Yagi-Uda (Like a TV aerial.) Signal radiates in lobes. Directional, so power is increased in that direction. Can be tight focus but needs precise setup and is then difficult to align Usually covers around 40 - 60 degrees Range increase depends on spread / sensible figures or calculation.  Corner reflector. Usually vertical, may be shown as corner of a cube. Signal from transmitter that hits the reflector is sent back in the reverse direction. Directional, so power is increased in that direction. Covers 90 degrees Range increase typically about four times / any sensible figures / calculations.		

<table>
<tr><th colspan="4">Applied GCE Unit 9 – Mark Scheme</th></tr>
<tr><th>Activity</th><th>Answer</th><th>Poss. Mark</th><th>Max</th></tr>
<tr><td></td><td>This is not an exclusive list.
Other types include flat panel, helical, horn. These are all directional, with radiation lobes, giving similar characteristics to the Yagi. Give marks for any sensible antenna type plus description of coverage.

3 x (1+1)</td><td></td><td></td></tr>
<tr><td></td><td></td><td>6</td><td></td></tr>
<tr><td>(c)</td><td>Notes on three factors other than antenna type, which would impact on the communication range in this scenario.</td><td></td><td></td></tr>
<tr><td></td><td>Description of a factor 1 mark
Action which would work 1 mark

<table>
<tr><td>Factor</td><td>Action</td></tr>
<tr><td>Obstacles
e.g. nearer islands may obstruct / absorb signal to more distant ones.
Vegetation may obstruct signal.</td><td>site antenna on poles to be above hut height
clear vegetation from signal paths
remove obstacle
use radio transparent materials.</td></tr>
<tr><td>Receiver sensitivity/quality.
If the receiver is not sensitive enough, the signal will not be picked up.</td><td>These are two way links, so the receiver should be the same type / quality as the transmitter</td></tr>
<tr><td>Cable losses /cables absorb energy
e.g. 1dB per metre / other reasonable figure,
long cables weaken the signal.</td><td>Use short, high quality cables to link antenna to transmitter / receiver</td></tr>
<tr><td>Interference.
From external radio equipment
microwave towers
any reasonable example.</td><td>Shield antennae from all directions except that of the required signal.</td></tr>
</table>

3X(1+1)</td><td></td><td></td></tr>
<tr><td></td><td></td><td>6</td><td>20</td></tr>
<tr><td>Activity 3</td><td>Components of a network</td><td></td><td></td></tr>
<tr><td>(a)</td><td></td><td></td><td></td></tr>
</table>

Applied GCE Unit 9 – Mark Scheme					
Activity	**Answer**			**Poss. Mark**	**Max**
	Cabin. 1 mark per component, with sensible reason. Needs to be in context Any 7 components:				
	Component	**Reason**	**Notes**		
	TV screen / Large monitor	needed for TV / video on demand	**Not** a standard monitor, it must be large enough for viewing as a TV		
	Keyboard / other device	needed to control computer / games	**Not** a standard keyboard. Needs to be robust, water / liquid proof. Possibly built in to a surface. Could be a handheld games controller type of device.		
	Mouse / other device	needed for cursor control / games	**Not** a standard mouse. Needs to be robust, water / liquid proof. Possibly built in to a surface. Could be a handheld games controller type of device or trackball.		
	Network connection	For intranet / internet	Probably a standard socket but could be armoured / hidden / wired in / wifi		
	Specified cables	For connecting devices	Any reasonable. e.g. PC to screen / network		
	PC	Runs the system.	could be a PC, or a games		

Applied GCE Unit 9 – Mark Scheme					
Activity	**Answer**			**Poss. Mark**	**Max**
			console type of machine. e.g. X Box, Wii,		
	other microprocessor system	For running games / multimedia	a games console type of machine. e.g. X Box, Wii,		
	Small hub / switch	May be needed to connect multiple devices	Only allow if more than one device specified above.		
	Sound system	For TV / video	May be built in to the screen. Allow here as well if this is stated on the screen line of the table.		
	Internet phone / microphone	For telephone services	**Not** a standard telephone. Must be something that can connect to the network. e.g. a VoIP phone / PC microphone.		
			7x1	**7**	
(b)	An explanation, using any **three** of the chosen items as examples, of how the candidate complied with the requirement that anything that may be used by a guest must be robust, intuitive to use, and visually appealing.				
	Items used by guests are: • TV screen / **Large** monitor • Keyboard / other device identified in (a) • Mouse / other device identified in (a) • Sound system • Phone For each of **3** items. 1 mark for explaining how it is robust 1 mark for explaining how it is intuitive 1 mark for explaining how it is visually appealing For a max of 6 marks there must be at least 1 explanation for each of the 3 items chosen.			**6**	

<table>
<tr><th colspan="6">Applied GCE Unit 9 – Mark Scheme</th></tr>
<tr><th>Activity</th><th colspan="3">Answer</th><th>Poss. Mark</th><th>Max</th></tr>
<tr><td></td><td colspan="3">If only 2 items are addressed, max is 4
If only 1 item is addressed, max is 3

Robust
Answers may include:
• Built in to wall / desk
• Metal / plastic / designed for heavy use, e.g. games controller
• Protective screen / hidden cables / armoured sockets

Intuitive
Answers may include:
• Clear icons on controls
• Simple menu systems
• Touch screens

Visually appealing
Answers may include:
• Matches room decor
• Common theme to all items
• Unusual / ethnic / local crafts appearance</td><td></td><td></td></tr>
<tr><td>(c)</td><td colspan="3"></td><td></td><td></td></tr>
<tr><td></td><td colspan="3">Island. 1 mark per component, with sensible reason. Needs to be in context.

Any three of:</td><td></td><td></td></tr>
<tr><td></td><td>Component</td><td>Reason</td><td>Notes</td><td></td><td></td></tr>
<tr><td></td><td>wifi antenna</td><td>for connection to rest of the network / long range connections</td><td>Needs to specify an antenna type, e.g. dish / Yagi / any directional antenna type.</td><td></td><td></td></tr>
<tr><td></td><td>wifi transceiver / media converter</td><td>generate wireless signal / convert wifi to cable</td><td>Any reasonable / standard wifi kit</td><td></td><td></td></tr>
<tr><td></td><td>Specified cables</td><td>For connecting devices</td><td>Any reasonable. e.g. wifi to cabins</td><td></td><td></td></tr>
<tr><td></td><td>Router / switch</td><td>For connecting transceiver to cabins</td><td>Allow both if link redundancy given as a reason for having both.</td><td></td><td></td></tr>
<tr><td></td><td>WAP</td><td>For connecting transceiver to cabins</td><td>standard short range wifi.</td><td>3</td><td></td></tr>
</table>

Applied GCE Unit 9 – Mark Scheme				
Activity	**Answer**		**Poss. Mark**	**Max**
(d)	**Other.** 1 mark per 2 components, with sensible reasons. Round up **Max 4.** Reasons are not asked for but the identification should make clear how many / much is needed.			
	Component	Notes		
	Server (min 2)	Server + backup		
	Workstation (min 15)	12 admin, 3 reception		
	Specified cables (min CAT6 and 300 metres, 200 metres if wifi used as below)	Probably CAT7 by 2010.		
	Wifi equipment.	Could be used for old hotel - new building		
	Router	Or other Internet connection		
	Switch (min 2)	One in old building, one in new		
	WAP	Could be used to e.g. allow laptops in administration		
	Laser printer BW	In Reception		
	2 x Laser printer Colour	In Administration		
	Network sockets (min 25)	As needed by counting up the devices / connections		
	Patch panels	One per building		
	Protective cabinets	For patch panels, switches, routers		
	Firewall (hardware)	For satellite connection		
	Other sensible networking infrastructure			
	1 mark per 2 components, with sensible reasons. Round up **Max 4**		**4**	**20**
Activity 4				
(a)	**A network design for the complete project**			
	Any 16 from: a) shows; 5 residential islands, 2 groups of old cabins, old hotel building with bedrooms, admin and reception areas, new hotel building with shop, restaurant and entertainment areas.			

Applied GCE Unit 9 – Mark Scheme			
Activity	**Answer**	**Poss. Mark**	**Max**
	b) cable types identified c) one residential island in detail, showing 4 cabins and a long range link to the network d) residential island, router / switch / combination device e) one old cabin group in detail, showing 5 cabins and a long range link to the network (allow cable) f) old cabin group, router / switch / combination device g) room / cabin, cable / wifi connection to network h) room / cabin, PC / equivalent device i) room / cabin, other part of system e.g. VoIP telephone, TV, connected to the system. j) old hotel building, one group of 3 admin workstations shown in detail. k) old hotel building, 3 other groups of workstations. Only links to network need be shown. l) old hotel building, 3 workstations in reception. m) old hotel building, server and backup server in sensible positions in the IT centre n) old hotel building, 2 networked colour laser printers in the admin area. o) old hotel building, 1 networked black and white laser printer in reception p) old hotel building, adequate switches in appropriate locations. Min of 40 ports needed. q) old hotel building, router with sensible connection to server r) old hotel building, link from router to satellite dish for Internet s) new hotel building, switch in sensible location with links to shop, restaurant, and entertainment area t) new hotel building, long range link to the network (allow cable) u) long range links to all residential islands and both groups of old cabins 16X1		
		16	
(b)	An explanation and justification of decisions made regarding the positioning of network devices and equipment other than long range wifi links.		
	There are no marks for descriptions of what is on the diagram. 1 mark per explanation which justifies a decision, to a maximum of 4. Answers may include:	**4**	

Applied GCE Unit 9 – Mark Scheme			
Activity	**Answer**	**Poss. Mark**	**Max**
	• server position • router position • network protection • number of switches • switch position • short range wifi provision • connection methods on islands / in old cabins 4x1		
(c)	An explanation and justification of decisions regarding wifi links, antenna types, and any other factors that affect wifi coverage		
	There are no marks for descriptions of what is on the diagram. 2 marks per explanation which justifies a decision, to a maximum of 6. Answers may include: • antenna type for required range. Need figures for second mark • antenna type for required coverage. Need angles / areas for second mark • antenna type / position to keep signals inside hotel boundary. Need angles / areas for second mark. • antenna site / signal path for clear signal. Need indication of what problems are being overcome for second mark. • Sensible reason for siting of WAPs 3x(1+1)		
		6	**26**
Activity 5			
(a)	Notes for Viro to include an explanation of: • why a class C should be used in the scheme EEEE • static and dynamic addresses • scopes • reservations		
	class C e.g. Because there are less than 100 / 255 machines in the system **static and dynamic addressing** e.g. Fixed addresses v ones allocated by a server	**4**	

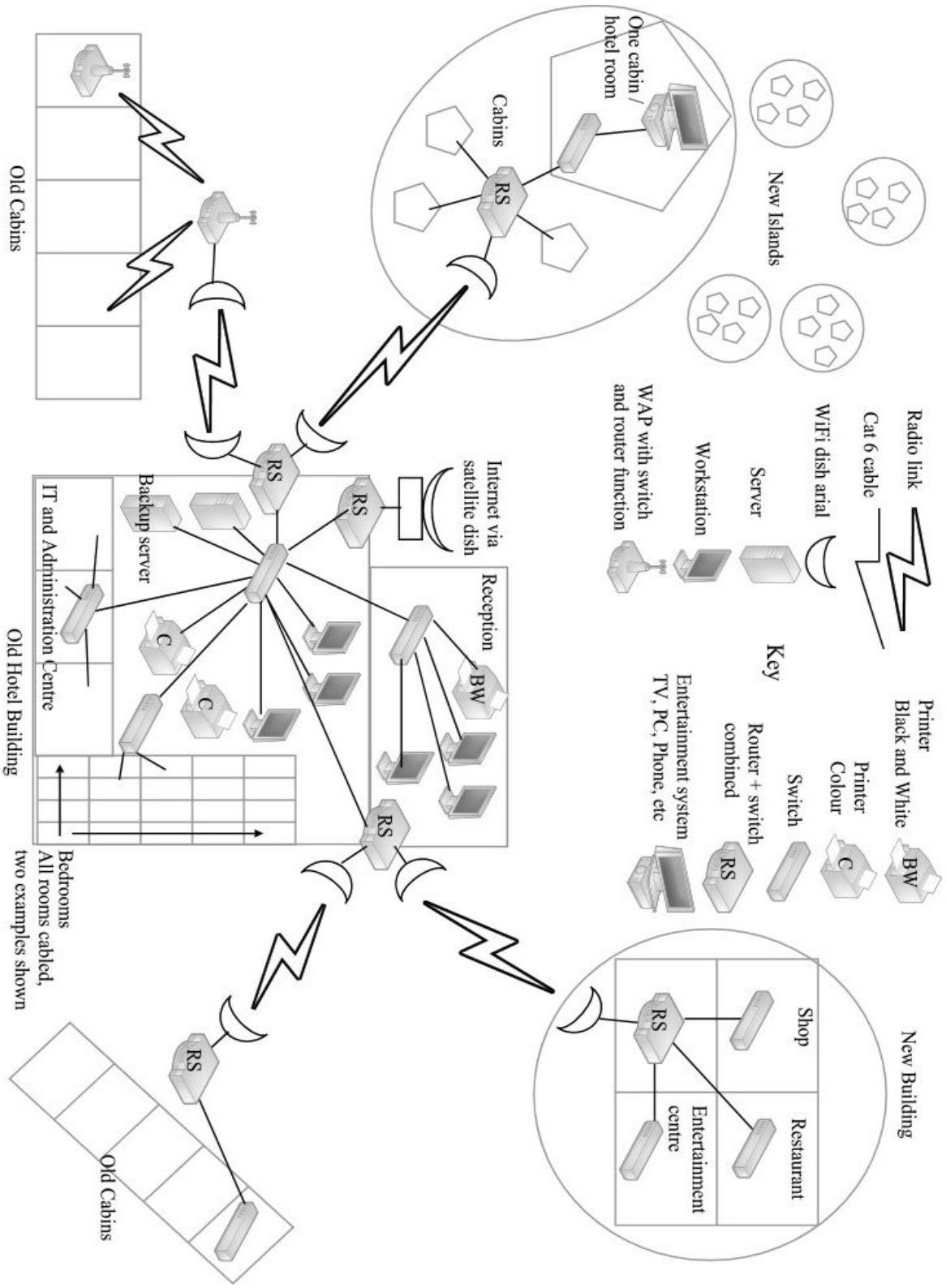
Applied GCE Unit 9 – Mark Scheme			
Activity	**Answer**	**Poss. Mark**	**Max**
	explanation of scopes e.g. a range of IP addresses administered by a DHCP server **explanation of reservations** e.g. an IP address within a scope / DHCP range that is allocated as a fixed address 4 x 1		
(b)	An identification scheme and justifications for the decisions.		
	Any 6 of: a) Static address for server. b) Server runs DHCP so cannot be in DHCP scope c) Static address for router. d) Router IP used by other machines to make connection so must be fixed. e) Static address for networked printer. f) e.g. Printer remote admin g) Static or Dynamic addresses for PCs, with justification. h) Static for WAPs / wifi transceivers i) e.g. WAP remote admin j) sensible use of sub-nets 6 x 1		
		6	**10**

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.

Network diagram



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