



Complete, fold and seal
(see note 2 below)

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12 Pages

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

List the numbers of the questions you have attempted	Office Use
1	25
3	18
4	16
Total	59

(Gweler yr ochr arall am y fersiwn Cymraeg)

79%



Q1a) i. The five iso functional areas are as follows.

1. Fault management:

- This area is responsible for the fault management aspects of the network.
- The steps are:
 - Detect a fault on the network.
 - Isolate the fault.
 - Correct the fault.
- A pre-emptive approach is best for reducing network downtime.
- This is the most widely used area.

2. Configuration management:

- Used to monitor network and system configurations.
- covers all configuration aspects of the network, such as:
 - Configuration file management.
 - Inventory management.
 - Software management.
 - Known naming conventions.
 - Contact person.

3. Security management:

- Used to control access to the network resources.
- covers all security ^{monitoring} aspects of the network, such as:
 - Access to network devices by authorised users only.
 - Access to corporate resources by authorised users only.

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- Any breach of these policies need to be reported to the network administrator.

4. Performance management!

- Covers all performance aspects of the network, the following performance parameters are monitored:
 - Downtime
 - Available bandwidth
 - Latency
 - Broadcast storms
- Each parameter should be set with a threshold, and if performance drops below the threshold, an alert should be triggered.
- The following metrics are measured:
 - Throughput
 - Utilization
 - response time
- The following steps are used to collect performance data:

Step 1. collect data.

Step 2. analyse data.

Step 3. Set threshold.

Step 4. monitor.

5. Accounting management!

- This covers all network ^{Services} ~~management~~ aspects of the network, such as:
 - What services are used?
 - When are they used?
 - Who ~~used~~ uses them?
 - and all logging and Auditing aspects.
- Administrators should measure the utilization of all important network services.

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- Analysis of data can provide good insight into network usage.

Q1)a) ii) The basic features of the network management platform are:

- Graphical user interface (GUI)
- Network map.
- Database management System (DBS)
- Customisable menu ~~S~~ System.
- Standard method to query devices.
- Event log.

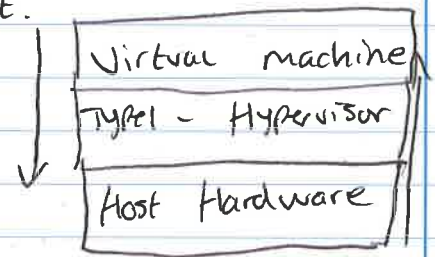
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Q3)a. i) Type-1 Hypervisor:

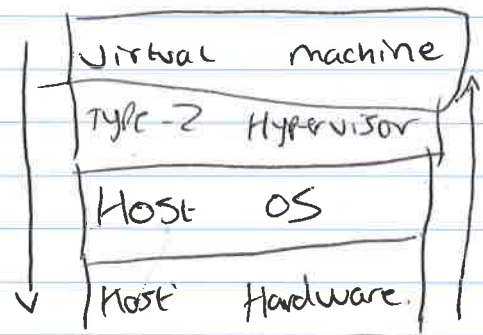
A type-1 Hypervisor or known as a bare metal hypervisor is a type of hypervisor that can interact directly with the hardware of a host machine. Unlike type-2 hypervisors, type-1 does not run on top of a host OS meaning performance can be improved. However, more processing power is needed to run it.

type-1 Hypervisors are more difficult to install.



Type-2 Hypervisor:

A type-2 Hypervisor, otherwise known as a hosted hypervisor, runs on top of the existing OS on the host computer. This means that to interact with the hardware, it must first go through the host operating system. This can slow down performance as it adds another layer to go through, however it can be cheaper than type-1 and easier to install.



ii) Virtual machine:

A virtual machine is a software based virtualized version of a physical computer. A virtual machine is designed to perform

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and act exactly as a physical machine would, ~~with an~~ The virtual machine runs on top of the hypervisor. the virtual machine can have its own operating system, independent of the OS on the host machine. In some cases, the virtual machine can be accessed on different host computers using cloud storage.

iii) Virtual Switching:

Virtual Switching is a technology that, similarly to virtual machines, virtualises physical switching devices into software based machines. Virtual Switching eliminates the need for physical switching devices, which can reduce costs. virtual machines can ~~be~~ assigned ip addresses and turned into servers.

iv) Management tools

Virtual machines are controlled with a virtual machine controller, this allows you to easily organize and group your virtual machines and even back them up to the cloud, making them accessible from any host machine with the software and an internet connection. The virtual controller also allows you to change virtual machine settings without actually booting the virtual machine up. Saving lots of time.

Q4) a.

~~Server~~
i.) Server load-balancing (SLB):

Server load balancing is a technology used to spread a load of traffic among multiple servers, rather than having all traffic go to one server on one interface. ~~Server load-balancing is a load-balancing~~ can be used to scale a data-centre, as well as improve performance and availability.

ii) Benefits of SLB:

- Scalability - Allows you to easily scale a network.
- High availability - If one server goes down, another server can pick up the load.
- Increased capacity - As the traffic is spread out evenly, the link is able to take on more traffic.
- Security - As traffic passes through the load balancer, it can be checked for threats.
- Disaster Recovery - Data can be load-balanced off-site to be backed-up in case of an emergency.

iii) Server-based load-balancing:

~~load~~ Server-based ~~clustering~~ ^{load-balancing} can come in two forms, cluster-based or software based.

In cluster-based load-balancing, two or more servers are combined in a cluster to form one single entity. This entity then requires

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access to a common resource, such as ~~the~~ Disk Data. The cluster is managed by a ~~set~~ piece of Software that manages the individual Servers, performs the load-balancing and detects any errors on the Servers. Clustering provides seamless failover and error recovery.

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The second form of Server-based clustering is ~~a~~ Software-based. In this solution each Server is installed individually with the desired Service. Each Server is then installed with a load balancer Software. When the Software receives a request, it decides whether to execute it on the Server that received it, or to pass it on to another Server in the load-balancing process.

Network-based Load-Balancing:

- In network-based load balancing, the network itself performs the load-balancing, while the Servers perform their installed Services. ~~However~~
- The network-based solution makes use of the accelerated hardware feature of network devices, to improve performance.
- In data-centre architecture, load-balancing is performed at the aggregation-layer, on either a router running IOS SLB, or a switch running Cisco application control engine (ACE)

4

16