

CITY UNIVERSITY OF HONG KONG

Course code & title : EE4217 Storage Technology

Session : Semester A 2011-2012

Time allowed : Two hours

This paper has FIVE pages (including this cover sheet)

1. This paper consists of 5 questions.
 2. Answer Any FOUR questions.
 3. Use a separate sheet for each question.
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*This is a **closed-book** examination.*

Candidates are allowed to use the following materials/aids:

Approved Calculator

Materials/aids other than those stated above are not permitted. Candidates will be subject to disciplinary action if any unauthorized materials or aids are found on them.

Question 1 (25 marks)

- 1 a) In Cache operations, Least Recently Used, Most Recently Used and Read Ahead algorithms are used. What are the differences between these three algorithms?

[9 marks]

- 1.b) SCSI disk performs better than IDE/ATA. Use a table to compare their speed, connectivity, pluggable architecture, performance and device-supported.

[10 marks]

- 1 c) Given the SCSI addressing protocol as below:

Initiator_ID	Target_ID	LUN
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For a UNIX host which has a path to a storage device that shows as c0 t1 d3, draw a diagram to show the path and explain what it means.

[6 marks]

Question 2 (25 marks)

- 2.a) As digital information increases, demand of different type of storages has increased. A latest type of storage systems called Storage Area Network has been widely used. What is a Storage Area Network (SAN)?

[6 marks]

- 2.b) What are the components of a SAN? State the two types of Fiber Channel Topologies based on their communication approaches.

[9 marks]

- 2.c) Storage Area Networks can handle large amounts of block level I/O and are suited to meet the demands of high performance applications that need access to data in real time. Explain when the SAN should be used and give one example.

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[10 marks]

/...3

Question 3 (25 marks)

- 3 a) Information has become a critical asset for businesses. The survival of a business depends on uninterrupted availability of the data. There are two objectives in designing the business continuity called Recovery Point Objective and Recovery Time objectives. What are they?

When a system failed, two design considerations can be adopted, i.e. Disaster Recovery and Disaster Restart. Explain the difference of these two approaches.

[8 marks]

- 3 b) Far from being antiquated, periodic backup is still a widely used method for preserving copies of data. What are the choices for setting up the Backup and Recovery Strategies?

[8 marks]

3. c) A manufacturing corporation uses tape as their primary backup storage media throughout the entire organization. Current Situation/Issue is:

- Full backups are run every Sunday. Incremental backups are run from Monday through Saturday. There are many backup servers in the environment, backing up different groups of servers.
- Their e-mail and database applications have to be shut down during the backup process.

The main concerns facing the corporation are:

- 1) Due to the de-centralized backup environment, recoverability of the backup servers is compromised.
- 2) Key applications have to be shut down during the backup process.
- 3) Too many tapes need to be mounted in order to perform a full recover, in case of a complete failure.

The company would like to:

- 1) Deploy an easy-to-manage backup environment.
- 2) Reduce the down time for the email and database applications
- 3) Reduce the number of tapes used to fully recover a server in case of failure.

Propose a backup and recovery solution to address the company's concern.

Justify how your solution will ensure that the company's needs are met.

[9 marks]

Question 4 (25 marks)

- 4 a) Virtualization provide logical views of physical resources while preserving the usage interfaces for those resources. State the benefits that virtualization will bring. . [6 marks]
- 4 b) How can a block-level virtualization implementation be used as a data migration tool? Explain how data migration will be accomplished and discuss the advantages of using this method for storage. Compare this method to traditional migration methods. [10 marks]
- 4 c) In a traditional LAN, workstations are connected to each other by means of a hub or a repeater. In Figure 5c below, the broadcast and collision domains in a LAN is configured such that the workstations, hubs, switches, and routers are physically connected together. Collision occurred and needed to be resolved, thereby incurring a significant wastage of time and resources. Suggest a method to overcome this issue. State the benefits of your suggested approach.

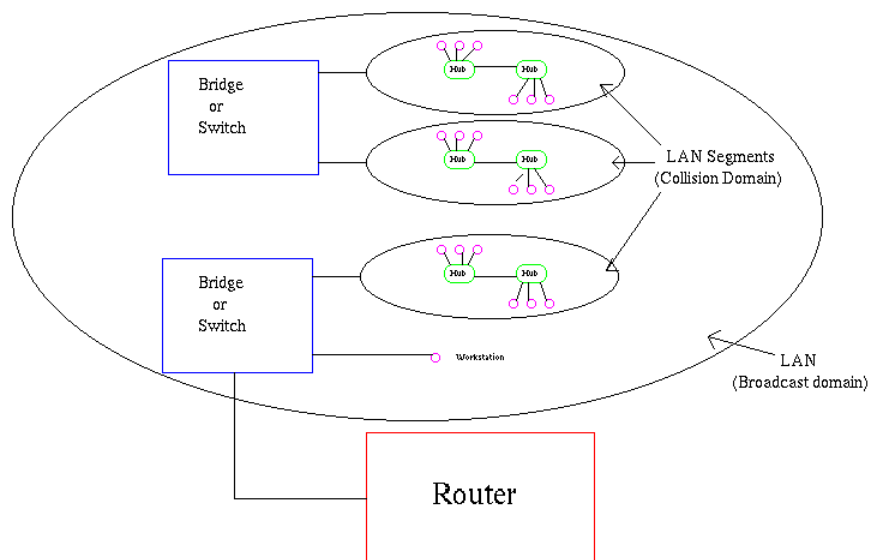


Figure 5 c

[9 marks]

/...5

Question 5 (25 marks)

- 5 a) There are some standard RAID configuration levels, each of which has benefits in terms of performance, capacity, data protection, etc. What is RAID3? State the benefits, drawbacks and possible application of RAID3.
- [8 marks]
- 5 b) Explain how RAID can be implemented and the concept of Hot Spare and Hot Swap?
- [9 marks]
- 5 c) Input and Output operations per second (IOPS) is a common performance measurement used to benchmark computer storage devices. An application has 1,000 heavy users at a peak of 2 IOPS each and 2,000 typical users at a peak of 1 IOPS each, with a read/write ratio of 2:1. It is estimated that the application also experiences an overhead of 20 percent for other workloads. Calculate the IOPS requirement for RAID 3.
- [8 marks]

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