

CITY UNIVERSITY OF HONG KONG

Course code & title : EE4217 Storage Technology
Session : Semester B 2013-2014
Time allowed : Two hours

This paper has FOUR 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.
-

*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) What is a RAID? What are the advantages of using RAIDS? [8 marks]
- 1.b) Command Queuing is used for a disk head movement control. For a scenario in which an I/O request from track 1 is followed by a request from track 2 on a sector that is 180 degrees away from the first request and then by a third request from a sector on track 3, which is adjacent to the sector on which the first request is made, what is a Command Queuing used under this scenario? Discuss the advantages and disadvantages of using Command Queuing in this scenario. [8 marks]
- 1 c) A media house uses lot of graphics/video applications and needs large throughputs for videos to get played without any jitter. Since they are in publishing business, they cannot afford downtimes. Even if there is any downtime they would like their data to be quickly reconstructed and enable them to continue without work in less time. Suggest the best RAID to use if cost is not a constraint and describe the mechanism of your suggested RAID system. [9 marks]

Question 2 (25 marks)

- 2.a) Traditionally, IP network traffic has been at the file system level. Now, emerging technologies provide for the transfer of block-level data over an existing IP network infrastructure called IP SAN. What is an IP SAN? State its benefits. [6 marks]
- 2.b) “Block storage over IP” represents several different approaches to moving block-level (channel) I/O over IP networks. The three protocols that are gaining most visibility today are iSCSI, FCIP, and iFCP. Each of these protocols leverages IP to extend and add value to the connectivity between hosts and external storage. What are these three basic protocols for constructing IP SAN? [9 marks]
- 2.c) A company is considering implementing storage. They do not have a current storage infrastructure to use, but they have a network that gives them good performance. Suggest what type of iSCSI architecture, i.e. Native, Bridging and Extension, should be used for localized operations and rationalize your recommendation. [10 marks]

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. Steps should be taken to ensure continuous availability of data in the event of a disaster. The Remote Replication is one of techniques used are for Business Continuity. What is the concept of Remote Replication?
- 3 b) In Remote Replication, both Synchronous and Asynchronous approaches can be used. What are the features of a Synchronous Remote Replication?
- 3 c) A Manufacturer maintains the storage of their mission critical applications on high-end Storage Arrays. The company has two data centers which are 300 miles apart. The company's mission critical Database application takes up 2 TB of storage on a high end Storage Array. In the past year, top management has become extremely concerned because they do not have DR plans which will allow for minimal RPO recovery if there is a site failure. The company would like explore remote replication scenarios which is suitable for the company at a minimal cost. Propose a remote replication solution to address the company's concern. Justify how your solution will ensure that the Company's needs are met.

[8 marks]

[9 marks]

[8 marks]

Question 4 (25 marks)

- 4 a) Access Control is one of the key approaches for ensuring system security. What are the four basic components in Access Control?
- 4 b) In Storage Networking Industry Association (SNIA) proposed Shared Storage Model, state any four paths for controlling the access to storage information.
- 4 c) What is an appropriate virtualization approach for data migration? Explain how data migration will be accomplished and discuss the advantages of using this method for storage. Compare this method to traditional data migration methods.

[8 marks]

[8 marks]

[9 marks]

Question 5 (25 marks)

- 5 a) List and describe three common data storage media or solutions. Suggest one application for these media or solutions. [9 marks]
- 5 b) A hard drive contains a series of rotating platters within a sealed case. The sealed case is known as Head Disk Assembly, or HDA. What are the three main hard disk components except spindle and their functions? [9 marks]
- 5 c) Mean time between failures (MTBF) is the mean (average) time between failures of a system, i.e. the reciprocal of the average failure rate when the failure rate is a constant. Given 5000 samples of disk tested, the failure rate is given in Table 5(c) below:

Samples	Failure Rate $\times 10^{-9} \text{s}^{-1}$
1000	1.1
2000	1.2
1500	1.25
500	1.75

Table 5 (c)

- (i) What is the MTBF of these disk samples?
- (ii) If these disks are used to construct a RAID 1 array, what will be the MTBF for the RAID 1 array pair?
- (iii) Similarly, what will be the MTBF for a RAID 5 array composed of 5 disks? [7 marks]

END