BITS Pilani, Dubai Campus
Dubai International Academic City, Dubai

Final Year CS
Second Semester, 2011-2012

Comprehensive Exam (Closed Book)

No of questions : 8
No of Pages : 2

Course No: CS C446 **Course Title: Data Storage Technologies & Networks**
Date: 12th Jun 2012 **Weightage: 40%**
Duration: 3 Hours **Max. Marks. 40**

1. **a)** Consider a single DASD system which runs a database application (eg. student information) and a web server application (for accessing the student information). Discuss based on the software overheads, the effect of hosting both applications on a single server. (Assume that the system run a standard OS) **[3M]**

   b) The implementation of a device driver, that uses a buffer to buffer copy is replaced with Direct Memory Access (DMA), describe its effect on the software overheads. **[2M]**

2. **a)** Distinguish clearly between Just a Bunch of Disks (JBOD) and RAID 0. **[2M]**
   b) What is meant by RAID 01 and RAID 10 configurations? Explain the differences (use suitable diagrams) **[3M]**

3. **a)** Explain why device drivers are split up into Top half and Bottom half. **[2M]**
   b) Explain the working of DiskSort (elevator algorithm) and its significance. **[3M]**

4. **a)** Explain with suitable diagrams the differences between fileservers using NFS protocol and DAFS protocol. **[3M]**
   b) Also show how DAFS will use RDMA protocol between the client and server. **[2M]**

5. **a)** Explain in detail how 8b/10b encoding works at the FC-1 layer **[3M]**
   b) Briefly explain any two types of Ordered Sets in FC-1 layer. **[2M]**

6. **a)** Using appropriate time line diagrams explain the different type of login services offered by FC protocol. **[3M]**
   b) Discuss as to how transmission errors are handled in FC-2 service class 2 & 3 **[2M]**
   (use time lines to show the packet transmission between servers and switches)

7. **a)** Explain the terms **Exchange**, **Sequence** used in transmission of data in FC-2 layer. Also explain how the relevant fields in the FC Frame header are used to keep track of the Exchange, Sequence and Frames. **[3M]**

b) A SCSI read command is issued by an application to read 4000 bytes of data from disk. Show the values of relevant fields in the Frame header during the data transfer. The read command consist of i) command ii) data iii) status. **[2M]**

8. A storage system is being built using the following components. **[5M]**

a) 1 CPU with a MTTF of 1,000,000 hrs
b) SCSI controllers with MTTF of 500,000 hours.
c) 500 GB SCSI Disk MTTF of 200,000 hours

System can support a maximum of 5 SCSI controllers, with each controller supporting a maximum of 4 SCSI disks.
Which of the following designs would be preferred for a system capable of storing 8 TB of data? (Ignore other failure costs)

a) 4 of the 5 controllers accommodate 2TB of data
b) 3 of the 5 controllers accommodate 2TB of data and remaining 2 controllers accommodate 1TB each.

****

BITS Pilani, Dubai Campus
Dubai International Academic City, Dubai

Final Year CS
Second Semester, 2011-2012

Test 2 (Open Book)

No of questions : 4
No of Pages : 2

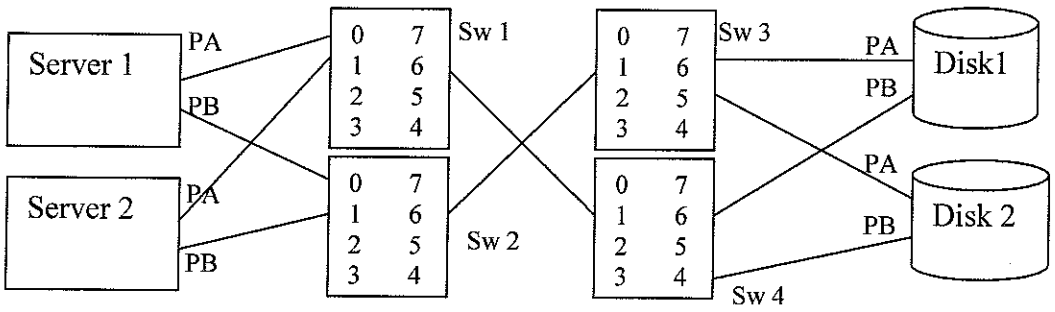
Course No: CS C446 | **Course Title: Data Storage Technologies & Networks**
Date: 23th May 2012 | **Weightage: 20%**
Duration: 50 minutes | **Max. Marks. 20**

---

1. **a)** Explain with reasons the kind of physical transmission mechanism that is employed at the FC-0 level. **[3M]**

b) For the following Fabric topology, show the assignment of Port_ID, WWPN, WWNN for each of the FC devices (Servers and Disk) **[2M]**

Server 1 WWNN = 10000010 20000010
Server 2 WWNN = 10000020 20000020
Disk 1 WWNN = 20000010 20000010
Disk 2 WWNN = 20000020 20000020
For all devices WWPN of PB is 1 + WWPN of PA



Port_ID	WWPN	WWNN	Device

2. **a)** For the binary bit 10110100 pattern to be transmitted show the Manchester encoding. **[2M]**

b) FC-1 layer uses a 8b/10b encoding. Explain the need of 8b/10b encoding used in the FC-1 layer. **[3M]**

3. **a)**. Explain clearly the difference between public loop and private loop in Arbitrated loop topology in FC protocol **[3M]**

b) Distinguish between Class 1 and Class 2 services in FC protocol. **[2M]**

4. **a)** What the need for flow control in the FC protocol stack. How is achieved **[2.5M]**

   b) The roundtrip time on a FC link between the sender and receiver is 100μsec. The sending node has an initial credit of 10 buffers. Show the available credits with the sender at the time a frame is transmitted at 0, 70, 120, 180, and 200 μsec. (All other delays can be neglected. Also there are no packet losses). **[2.5M]**

BITS Pilani, Dubai Campus
Dubai International Academic City, Dubai

Final Year CS
Second Semester, 2011-2012

Test 1 (Closed Book)

No of questions : 5
No of Pages : 1

Course No: CS C446 — **Course Title: Data Storage Technologies & Networks**
Date: 04th Apr 2012 — **Weightage: 25%**
Duration: 50 minutes — **Max. Marks. 25**

1. **a)** Explain the need for Arbitration Phase on a SCSI Bus. **[2M]**
   b) Explain how the Arbitration takes place on a SCSI Bus **[3M]**

2. **a)** Explain the important function provide by the different sections on the Device Drives code. **[3M]**
   b) Explain the need of buffer-caches in block device driver. **[2M]**

3. **a)** Explain the differences between the RAID 2 and RAID 3 configurations. **[2M]**
   b) Explain the write penalty overhead in RAID 4 configuration. **[3M]**

4. **a)** A RAID 6 configuration using row-diagonal parity scheme for error detection and correction has 4 data disks, 1 row parity disk and 1 diagonal parity disk. The data in the 4 data disks are show below .

Data Disk 0	Data Disk 1	Data Disk 2	Data Disk 3	Row Parity Disk	Diagonal Parity Disk
5	6	7	8		
1	2	3	4		
3	2	6	9		
4	4	7	7		

   i) Compute the parity information in the parity disk and diagonal parity disk. **[2M]**
   ii) If disks 2 & 3 fail, show the reconstruction steps of data recovery process. **[3M]**

5. A storage system is being built using the following components.
   a) 1 CPU with a MTTF of 1,000,000 hrs
   b) SCSI controllers with MTTF of 500,000 hours.
   c) 500 GB SCSI Disk MTTF of 250,000 hours

   [5M]

   System can support a maximum of 5 SCSI controllers, with each controller supporting a maximum of 4 SCSI disks. Calculate the reliability of a system capable of storing 10 TB of data, in terms of MTTF in hrs. (Ignore all other failure costs).

Name: **ID No :**

DD 0	DD 1	DD 2	DD 3	RP	DP

DD 0	DD 1	DD 2	DD 3	RP	DP

DD 0	DD 1	DD 2	DD 3	RP	DP

DD 0	DD 1	DD 2	DD 3	RP	DP

DD 0	DD 1	DD 2	DD 3	RP	DP

DD 0	DD 1	DD 2	DD 3	RP	DP

DD 0	DD 1	DD 2	DD 3	RP	DP

DD 0	DD 1	DD 2	DD 3	RP	DP

DD 0	DD 1	DD 2	DD 3	RP	DP

DD 0	DD 1	DD 2	DD 3	RP	DP

DD 0	DD 1	DD 2	DD 3	RP	DP

DD 0	DD 1	DD 2	DD 3	RP	DP

BITS PILANI, DUBAI CAMPUS
SECOND SEMESTER 2011 – 2012
FINAL YEAR (CS)
QUIZ 2

No of Questions: 6
No of Pages : 2

Course Code: CS C446 | Date: 20.05.12
Course Title: Data Storage Technologies and Network | Max Marks: 07
Duration: 20 minutes | Weightage: 7%

Name: ..... **ID No:** ..... **Sec / Prog:** .....

Instructions: Pl write full sentences not just the bullet points as they don't convey the full information. Also diagrams must be supplemented with some explanation. Write your answers in the blank space provided after each question. You may use the reverse side if necessary.

1. What is the role and the need of kernel agent in VI Architecture? **[1M]**

2. Describe the send operation on the VIA capable Network Interface Card (NIC) **[2M]**

3. How does Remote Direct Memory Access (RDMA) work? **[1M]**

4. How does the Direct Access File System (DAFS) improve the file system performance between the client and server? **[1M]**

5. What is Sockets Direct Protocol (SDP) **[1M]**

6. The Effective bandwidth observed for a 2KB message size on a 1 Gbps network is 500 Mbps. Calculate the software overhead in the message communications. **[1M]**

♣♣♣♣♣

BITS PILANI, DUBAI CAMPUS
SECOND SEMESTER 2011 – 2012
FINAL YEAR (CS)
QUIZ 1

No of Questions: 6
No of Pages : 2

Course Code: CS C446 | Date: 26.03.12
Course Title: Data Storage Technologies and Network | Max Marks: 08
Duration: 20 minutes | Weightage: 8%

Name: . . . . . **ID No:** . . . . . **Sec / Prog:** . . . . . .

Instructions: Write your answers in the blank space provided after each question. You may use the reverse side if necessary.

1. What are the motivating factors that demand special design considerations for storages? **[1M]**

2. What do you mean by DASD (Direct Attached Storage)? What are the causes of software overheads associated with disk access **[2M]**

3. What are the steps in involved in read data sector by the cpu? **[1M]**

4. Distinguish between temporal and special locality, with simple examples **[1M]**

5. What are the differences between NAS (Network Attached Storage) as compared to Server Centric Storage? What are the implications? **[2M]**

6. Calculate the access time (ms) to read 5 consecutive sectors from a disk with the following parameters, Rotational Rage = 15,000 RPM, Average Seek Time = 5ms, Average no sectors/track = 500; Bytes per sector = 512. **[1M]**

♣ ♣ ♣ ♣ ♣