

EE4217 Test – 2014 solution

- 1.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]

Ans:

- IP SAN is a traditional SAN technology built around Fibre Channel
- IP technology is emerging as an alternative or supplemental transport for storage traffic
- Benefits
 - Cost Effective
 - Extend the reach of a SAN

[2 each total 6 marks]

- 1 b) In Remote Replication, both Synchronous and Asynchronous approaches can be used. What are the features of a Synchronous Remote Replication?

[9 marks]

Ans:

- A write has to be secured on the remote replica and the source before it is acknowledged to the host
 - Ensures that the source and remote replica have identical data at all times
 - Write ordering is maintained at all times
 - Replica receives writes in exactly the same order as the source
- Synchronous replication provides the lowest RPO and RTO
 - Goal is zero RPO
 - RTO is as small as the time it takes to start application on the remote site
- Response Time Extension
 - Application response time will be extended due to synchronous replication

- Data must be transmitted to remote site before write can be acknowledged
- Time to transmit will depend on distance and bandwidth

●Bandwidth

- To minimize impact on response time, sufficient bandwidth must be provided for at all times

[2 each total 8 marks]

●Rarely deployed beyond 200 km

[1 mark]

1. 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 1(c) below:

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

Table 1 (c)

- What is the MTBF of these disk samples?
- If these disks are used to construct a RAID 1 array, what will be the MTBF for the RAID 1 array pair?

[5 marks]

Ans:

- (i) Total Failure rate F_T

$$= (1000 \times 1.1 + 2000 \times 1.2 + 1500 \times 1.25 + 500 \times 1.75) \times 10^{-9} \text{s}$$

$$= 6250 \times 10^{-9} \text{s} \quad [1 \text{ mark}]$$

$$\text{Average Failure rate } F_A = 6250 \times 10^{-9} \text{s} / 5000 = 1.25 \times 10^{-9} \text{s} \quad [1 \text{ mark}]$$

$$\text{MTBF} = 1 / F_A = 1 / 1.25 \times 10^{-9} \text{s} = 0.8 \times 10^9 \text{s} = 222,222 \text{ hr} \quad [1 \text{ mark}]$$

- (ii) For RAID 1, the MTPF drops to $222,222/2 = 111,111 \text{ hrs}$

[2 mark]