[3 Hours] **[80 Marks]**

Note: 1. Question number 1 is compulsory. Solve any three out of remaining.

2. Draw figure wherever necessary.

3. Assume suitable data wherever necessary.

Q1.

a. Design and implement ILM for Storage Management system. 5 Marks

b. Consider a disk I/O system in which an I/O request arrives at a rate of 200 IOPS. The service time, R_s=8ms. Calculate the following measures of disk performance:
   a) Utilization of I/O controller (U)
   b) Total response time (R)
   c) Average queue size
   d) Total time spent by request in the queue. 5 Marks

c. Explain Boolean queries with an example. 5 Marks

d. Explain different types of backup with real time examples. 5 Marks

Q2 a. Consider an application that generates 3600 IOP with 60% reads and 40% writes. Calculate the disk load for different RAID levels. Also explain the steps for write penalty calculation and list the read and write penalty for different RAID levels. 10 Marks

b. Explain FC Protocol Stack and FC SAN topologies. 10 Marks

Q3 a. Explain in detail the different components required to design Intelligent Storage System. 10 Marks

b. Explain BC planning lifecycle with an example. 10 Marks

Q4 a. Explain IP Storage standards. 10 Marks

b. Explain Multilingual retrieval systems. 10 Marks

Q5 a. Explain different components of information system and its types. 10 Marks

b. Explain Network Data Management Protocol (NDMP) 10 Marks

Q6 Write a short note on 20 Marks

a) IP Storage
b) NAS
c) Stemming
d) Symmetric and Asymmetric virtualization