33 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Ashwin

Exam.	**Back**		
Level	BE	**Full Marks**	80
Programme	BCT	**Pass Marks**	32
Year / Part	IV / I	**Time**	3 hrs.

Subject: - Distributed System *(CT703)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Define distributed system? Explain Transparency Properties of Distributed System. [2+6]
2. Why naming is necessary in distributed system? Explain Sun Network File System architecture with its features. [2+6]
3. What is DNS? Explain the DNS working mechanisms with suitable example. [2+6]
4. What do you mean by DOS (Distributed Operating System)? Briefly explain the Monolithic and microkernel architectures of operation system. [2+4]
5. Define Object Adapter. Explain the invocation methods in CORBA. [2+4]
6. What is Network Time Protocol (NTP)? How Berkeley minimizes the problems of single time server failures of Chistian's algorithm. [2+4]
7. What is the need of an election algorithm? Explain non token based Ricart-Agrawala mutual exclusion algorithm along with an example. [2+6]
8. Differentiate between passive and active replication approach. Discuss with a technique that make the distributed system highly available. [3+5]
9. Write down the rule of two-version locking. Explain how Optimistic concurrency control mechanism works? [2+6]
10. How does triple modular redundancy works? Explain how reliable client server communication can be achieved in distributed system. [4+4]
11. Write short notes on: (any two) [3+3]
    i) Lamport's clock
    ii) TIB/Rendezvous
    iii) Feedback suppression mechanism in M-cast communication

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33 TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

Examination Control Division

2074 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Distributed System *(CT703)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Why there are challenges in achieving some requirements of a distributed system? Explain the challenges associated with different requirements of distributed system. [2+6]
2. Define distributed object and IDL. Compare RPC and RMI architecture. [3+5]
3. What is stateful and stateless service in file system? Explain the DNS working mechanism with suitable practical example. [3+5]
4. What are the characteristics of distributed operating system? Explain ORB and its interfaces. [4+4]
5. Why clock synchronization is necessary? Explain the clock synchronization algorithm using vector clock along with an example. [2+6]
6. Describe non-token based centralized and Ricart Agrawala algorithm with example and compare them. [8]
7. Differentiate between active and passive replication. Explain working mechanism of active replication. [3+5]
8. How cascading aborts occurs and solved? Explain three phase commit protocol with state diagram. [8]
9. What is K-fault tolerant system? Explain fault recovery techniques. [2+6]
10. Write short notes on: (Any two) [2×4]
    a) Distributed deadlock and recovery
    b) MACH
    c) Process Resilience

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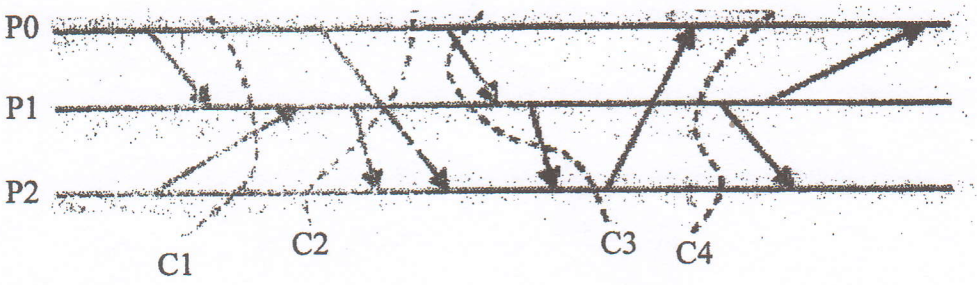
35 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Shrawan

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Distributed System *(CT703)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What are the principle applications of Distributed System (DS)? Discuss the advantages and disadvantages of DS. [3+5]
2. What are the requirements of Distributed File System? Describe file service architecture for Distributed File System. [4+4]
3. a) Why naming is necessary in distributed system? Explain Domain Naming Service (DNS) with its features. [1+4]
   b) What are the advantages of micro-kernel over monolithic-kernel? In your view, which kernel is preferable for distributed Operating system and why? [2+3]
4. a) What are the components of CORBA environment? [4]
   b) What do you mean by logical clock? Explain Lamport's Logical clock. [2+6]
5. What are the principle applications of state recording and distributed debugging? Determine the types of distributed CUT in the following figure. [4+6]



6. Define distributed coordination in DS? Explain how token ring algorithm works for mutual exclusion in DS. [2+6]
7. Define replication and fault tolerance in DS and explain why are they necessary? Explain how replication enhanced scalability for DS. [6+2]
8. What is LOCK and DEADLOCK in DS? Discuss the methods of distributed deadlock avoidance. [4+6]
9. Write short notes on: [2×3]
   i) Process Resilience
   ii) Mach

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33 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Distributed System *(CT703)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Differentiate between centralized and distributed system? Explain the design issues related to distributed system. [2+6]
2. Discuss the importance of Distributed File System (DFS). Describe the operations of SUNNFS with its properties. [2+6]
3. Explain RMI with suitable diagram. How RMI is superior to RPC? [8+2]
4. What is the role of middleware in DS? Explain about CORBA and its services. [2+8]
5. Differentiate between physical clock and logical clock. Why it is difficult to synchronize physical clock? Describe a method for physical clock synchronization. [2+2+6]
6. What are the basic requirements for mutual exclusion in distributed system? Explain the non-token based distributed mutual exclusion algorithm and compare it with token based algorithm. [2+8]
7. What are the reasons for Replication? Explain active replication model with its advantages and disadvantages. [3+5]
8. What do you mean by nested transactions? Explain optimistic concurrency control method with its advantages over other concurrency control methods. [2+4+2]
9. Write short notes on: [4+4]
   i) Distributed OS
   ii) JINI

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33 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Distributed System *(CT703)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt All questions.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Assume suitable data if necessary.*

1. What is Distributed System? Discuss the challenges of Distribution System with example. [2+6]
2. Mention the role of IDL and middleware in Distributed System. Explain RMI approach in the distributed object based system. [4+6]
3. Define DFS. How does DFS encourage sharing a storage device? Explain with the help of suitable architecture. [8]
4. How threads differ from process? How does checkpoint help in recovery? What does distributed commit refer to? [4+2+2]
5. Define flat and nested transaction. Discuss the approach of optimistic concurrency control in distributed transactions. [4+6]
6. Why it is difficult to synchronize physical clock? Explain how clock synchronization can be solved using logical clock. [2+6]
7. What are the reasons for replicating the service provide? Discuss about fault tolerant services. [4+4]
8. How cascading aborts occurs and can be solved? Explain the needs and roles of atomic commit protocol in distributed system. [8]
9. Write short notes on: [4×3]
   a) Christian's Algorithm
   b) Recovery approach in Distributed System
   c) CORBA services
   d) Monolithic and Microkernel

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35 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Distributed System *(CT703)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

[1] Discuss the properties of Distributed System (DS). How interaction model addresses the relevant issues in DS? [6+2]

[2] What is the importance of IDL in RMI? Write the operation of static RMI. [3+5]

[3] What are the characteristics of SUN-NFS? Discuss with its architecture. [3+5]

[4] What are the common problems of physical clock synchronization algorithms? Write Chandy-Lamport's algorithm for recording global states in Distributed System. [3+5]

[5] Measure the performance issue of non-token based Ricart-Agrawal Algorithm. Write alternate algorithm to address those performance issues. [2+6]

[6] How to come to consensus in DS? Discuss with an approach, how do you make the distributed system service highly available? [3+5]

[7] What are the relationships between parent and child transactions in DS? Write the problems of locking with the solutions to avoid it. [4+8]

[8] How do you avoid faults in DS? Compare independent chekpointing with coordinated checkpointing approach. [4+4]

[9] Write short notes on (**Any Three**) [4+4+4]

[a] Monolithic and Micro-Kernel

[b] Services provided by CORBA with the functions of Object Adapter

[c] Two Phase Distributed Commit

[d] Distributed Debugging.

[e] RPC communication semantics

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33 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Distributed System (CT703)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. "Distributed system acts as a single coherent system to its end user." Justify the statement with its features and challenges. What is fundamental model? [6+2]
2. Define DFS. How RMI perform communication between distributed objects? Explain. [2+6]
3. Verify with proper explanations that DNS is a distributed hierarchical database system. [10]
4. Write the importance of election algorithm. Explain BULLY algorithm with suitable example. Compare it with Ring based algorithm. [8]
5. List the goals of JINI. What are CORBA services? How does operating system support for distributed system? [4+2+2]
6. Explain with algorithmic steps, how token ring algorithm works for mutual exclusion in distributed system. [10]
7. Explain Byzantine general problem to handle faulty process with example. Describe any one failure recovery technique. [8]
8. Define lock in concurrency control. How can concurrency be controlled in distributed transactions? What situation does lead to distributed deadlock? [1+4+3]
9. Write short notes on: [3×4]
   a) Heterogeneity in distributed system
   b) Rendezvous concept and implementation
   c) Flat versus nested locks
   d) Process Resilience

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35 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Distributed System *(CT703)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Define Distributed System, What are advantages and disadvantages of distributed system? [2+6]
2. Draw and explain distributed file service architecture. How does that architecture encourage the sharing of storage resources in distributed system? Explain. [6+2]
3. Differentiate between RPC and RMI. How does modern RPC maintain the transparency in distributed system? [2+6]
4. Compare process and threads. Why threads are important in distributed System. [2+2]
5. Give an example of heterogeneous model of distributed application. How is distributed operating system realized in practical distributed systems? Explain. [2+4]
6. What do you mean physical and logical clocks? Explain Network Time Protocol and Berkeley Algorithm for physical clock synchronization. [2+4+2]
7. How does mutual exclusion help in co-ordination in distributed system? Explain the way how Lamport algorithm ensures mutual exclusion? [2+6]
8. What are the major objectives for replication in distributed system? Explain primary backup model for fault tolerance. [3+5]
9. Differentiate between nested transaction and distributed transaction with examples. How is commitment ensured in distributed transactions? [2+6]
10. What do you mean by fault tolerant system? What do you mean by Byzantine Failure? Explain Byzantine Generals problem to illustrate how agreement can be reached in faulty system. [1+2+5]
11. Write short notes on: [3+3]
    a) Comparison of CORBA and Mach
    b) Timestamp ordering in concurrency control

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35 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Ashad

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Distributed System *(CT703)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. How do you define Distributed System? Explain with the model, how hardware, data and controls are distributed in the distributed system environment. [2+6]
2. Explain the ways how distributed objects communicate with each other. Differentiate between RPC and RMI. [4+4]
3. Define distributed file system. Draw and explain distributed file service architecture in detail. [2+6]
4. Differentiate between homogeneous and heterogeneous distributed applications with example. [4]
5. Compare physical clocks and logical clocks with its implementation semantics. Describe Lamport's timestamp algorithm with its benefits and drawbacks. [2+6]
6. Explain any one election technique in Distributed System. Discuss with steps how consensus can be achieved in Distributed System. [5+3]
7. How do you say that replication is one of the scaling techniques in Distributed System? How to handle concurrent invocations with object replication in distributed object based system? [2+4]
8. What are the roles of atomic commitment protocol (ACP) in distributed transactions? Explain the different methods of concurrency control in distributed transactions. [2+6]
9. What are the dependability requirements of fault tolerant system? What do you mean by K-fault tolerant? How to come agreement in faulty system? Explain with the approach of byzantine generals problem. [2+2+4]
10. Write different services provided by CORBA. What are dynamic and static invocation approaches of CORBA. [2+4]
11. Write short notes on: [4+4]
    a) Process and threads in OS
    b) Distributed commit

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35 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Chaitra

Exam.	[redacted]	
Level	BE	[redacted]
Programme	BCT	[redacted]
Year / Part	IV / I	**Time**

Subject: - Distributed System *(CT703)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What are the major goals of distributed system? Explain the need of transparency in distributed system along with the challenges in achieving that. [4+4]
2. How do you convince that middleware plays the important role in Distributed System? Explain the operation of RPC in client server communication in Distributed System. [3+5]
3. What do you mean by file and directory service? Explain the operation of SUN NFS with its architecture. [3+5]
4. Why network operating system (NOS) is widely preferred over distributed operating system (DOS) in practical distributed systems? Explain DOS as a middleware. [4+4]
5. Define logical and physical clocks. Explain Lamport timestamp algorithm along with an example. [2+6]
6. Present a practical scenario where you need an election algorithm. Explain an election algorithm with example that is suitable to your scenario. [2+4]
7. Compare passive replication with active replication approach. Also discuss with a technique that make the distributed system service highly available. [2+4]
8. What do you mean by Distributed Deadlock? Explain the two-phase commit protocol of handling distributed transaction. [2+5]
9. What are the flat and nested transactions? Describe the methods for concurrency control in distributed system. [3+4]
10. What do you mean by faults, failures and errors? How do you handle faults in Distributed System? Explain process resilience approach in brief. [2+2+4]
11. What is IDL? Explain CORBA RMI with its services. [2+4]

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33U TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Chaitra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Distributed System *(Elective I)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Describe precisely what is meant by a scalable system. Explain distribution transparency in Distributed Systems. [4+4]
2. Explain how GFS handles client request? [8]
3. Why do we have single master in GFS managing millions of chunk servers? What are done to manage it without overloading single master? [8]
4. Explain the control flow of write mutation with diagram. [8]
5. Suppose your company got more investment so you can now increase your default replication order by 2 from current value 3 so as to make it your data more available and reliable. Suddenly master has to create two replicas of each file chunks. Yet, it has to satisfy client request which are more important than just replication. How does single master manage re-replication task? [8]
6. List and explain four main master operations in GFS. [4]
7. Explain term 'NoSQL'. Why does normalization fail in data analytics scenario? [4+4]
8. Define the components that make up a basic MapReduce job and illustrate with diagram how does the data flow through Hadoop MapReduce. [8]

33A TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Baishakh

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Distributed System *(Elective I)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ ***All** questions carry equal marks.*
- ✓ *Assume suitable data if necessary.*

1. a. Discuss pitfalls of distributed system.
   b. What are goals of distributed system? Explain scalability goal in detail.
2. a. Explain Distributed computing systems.
   b. Define architectural styles. Describe common architectural styles.
3. a. Explain different centralized system architectures.
   b. Discuss super peer in decentralized architecture.
4. a. Discuss the single master aspect of GFS architecture.
   b. Enlist GFS metadata. Why chunk locations not persisted by master, discuss it.
5. a. Discuss consistency guarantees made by GFS.
   b. Explain the lease mechanism in GFS with examples.
6. a. Discuss GFS high availability.
   b. Discuss re-replication and rebalancing role of GFS master.
7. Define referential transparency with example. Explain mapreduce program execution flow.
8. a. Write pseudo code for inverted index (term vector per host) generation through mapreduce.
   b. Discuss fault tolerance of mapreduce jobs.

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46P TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2067 Mangsir

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Distributed System *(Elective II)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Discuss the important characteristics of Distributed Systems. Explain distribution transpareny goal of distributed systems (3+7)
2. What is an architectural style? Discuss with one example structured P2P architecture. What is a super peer , discuss its usage in P2P systems? (2+4+4)
3. Discuss assumptions made in GFS design and their consequences. Explain the metadata of GFS? (6+4)
4. Explain data and control flow and working of lease mechanish in normal write operation of GFS. (10)
5. Discuss the main points that MR draws from referential transpareny in functional programming. With an example of your choice explain the MapReduce programming model. (3+8)
6. You are given student records consisting of following fields in each record: (10)
   rollno(integer),department id (integer), name (string),subject code(integer),score on the subject (double). You can assume the delimiter of the fields as space. It is required to calculate the agerage value of score for a student and present the average score and total score along with name, department and rollno of the student in the output records. The order of the output be according to rollno, and if the same rollno appear in two departments then by rollno+department. (Note here that the rollno and department id are integers not strings).
   Write a complete code for mapper,reducer,combiner(if any),partitioner(if any)in Java language on Hadoop platform. You can ommit the job submission and imports part. Clearly specify the key/value data types in each phase.

   OR

   Write a complete pseudocode for mapper,reducer,partitioner(if any),combiner(if any) along with clear explanation of the key/value types in each phase. (10)
7. Discuss the problems associated with parameter passing in RPC. Explain with diagram different alternatives of asynchronous RPC. (6+4)
8. Explain any 3 of the following (3X3)
   a) Use of multicast communication in Distributed systems
   b) External sort is related with MR programming model in Hadoop
   c) Compression can improve the performance of MapReduce job
   d) P2P style of architecture of Cassandra (just discuss to show the p2p style not the entire architecture)

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