



Printed Pages : 4

TCS - 801 / TIT - 801

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0147-0192

Roll No.

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B. Tech.

(SEM. VIII) EXAMINATION, 2008-09

DISTRIBUTED SYSTEMS

Time : 3 Hours]

[Total Marks : 100

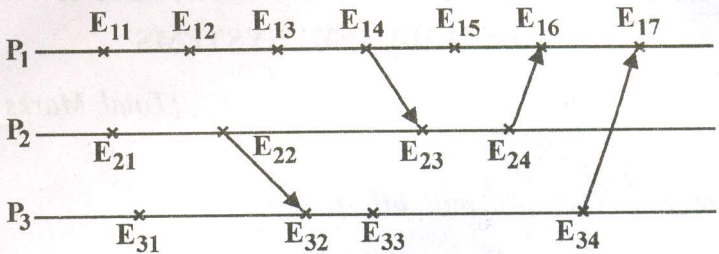
- Note :
- (1) Attempt all questions.
 - (2) All questions carry equal marks.

1 Answer any **four** parts of the following :

- (a) What are distributed systems ? What are significant advantages and limitations of distributed systems ? Explain with the example, what could be the impact of absence of global clock and shared memory ?
- (b) Why is scalability an important feature in the design of distributed system ? Discuss some of the guiding principles for designing a scalable distributed system.



- (c) What are Vector Clocks ? Explain with the help of implementation rule of Vector Clocks, how they are implemented. What are the advantages of Vector Clock over Lamport Clock ? For the space time diagram shown below, obtain the vector time stamp of various events :



- (d) What do you mean by Global state of the distributed system ? What are the differences between consistent Global state. Transitless Global State and strongly Consistent Global State ?
- (e) What do you mean by casual ordering of message ? If process P sends two messages M_1 and M_2 to another process Q , what problem may arise if the two messages are not received by recipient Q , in the order they were sent by process P . Develop an algorithm which guarantees the casual ordering of message in distributed system.
- (f) What do you mean by problem of Mutual Exclusion in distributed system ? What are the requirements of a good mutual exclusion algorithm ? Explain the performance matrices to judge the performance of distributed mutual exclusion algorithm.

2 Attempt any **two** of the following :

- (a) Explain how the two-phase commit protocol for nested transactions ensures that if the top-level transaction commits, all the right descendants are committed or aborted.
- (b) What are agreement protocols ? What are Byzantine agreement problem, the consensus problem and Interactive Consistency Problem ?
- (c) What is the problem of distributed deadlock detection ? What are the differences in Centralized, Distributed and Hierarchical control organizations for distributed deadlock detection ? What are advantages of distributed control organization over centralized control organization for distributed deadlock detection ?

3 Attempt any **two** of the following :

- (a) What do you mean by distributed objects ? Explain the concept of remote method invocation with a suitable example. How are the parameters and results passed to a remote procedure ? Explain with a suitable example.
- (b) Which features of the AFS design make it more scalable than NFS ? What are the limits on its scalability, assuming that servers can be added as required ? Which recent developments offer greater scalability ?
- (c) What is a digital signature ? What are its uses in the security of a distributed system ? Give a method to create a digital signature. Describe how digital signature can be used for ensuring message integrity in a distributed system.

4 Attempt any **two** of the following :

- (a) Explain why serial equivalence requires that once a transaction has released a lock on an object, it is not allowed to obtain any more locks.

A server manages the objects a_1, a_2, \dots, a_n . The server provides two operations for its clients :

read (i) returns the value of a_i .

write (i, value) assigns value to a_i .

The transaction T and U are defined as follows :

T : x = read (i); write (j, 44);

U : Write (i, 55); write (j, 66);

Describe an interleaving of the transaction T and U in which locks are released early with the effect that the interleaving is not serially equivalent.

- (b) What are locks ? What are essential differences in the lock-based protocols and Time stamp-based protocols ?
- (c) What are commit protocols ? Explain how two-phase commit protocols respond to failure of participating site and failure of co-ordinator.

5 Answer any **two** of the following :

- (a) What are the differences in centralized and distributed algorithms ? How is the performance of a distributed algorithm evaluated ? Explain the term, message complexity in reference to distributed algorithm.
- (b) Explain why the interfaces to remote objects in general and CORBA objects in particular do not provide constructors. Explain how CORBA objects can be created in the absence of constructors.
- (c) Write short notes on :
- (i) Destination based routing.
 - (ii) Deadlock Free Packet Switching
 - (iii) Balanced sliding window protocol.

