

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 : $x = \text{read}(i)$; 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.

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.

1/2/20



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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.

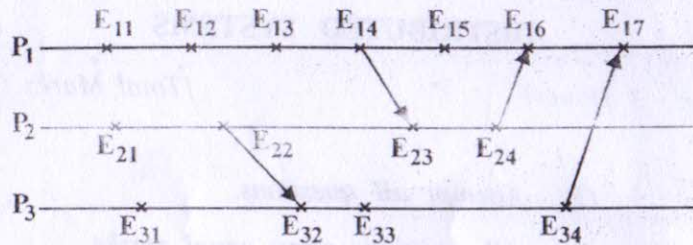
(2) All questions carry equal marks.

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 M1 and M2 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.