B.Tech.

(SEM. VII) THEORY EXAMINATION 2011-12

## DISTRIBUTED SYSTEMS

Time : 3 Hours   *Total Marks : 100*

Note :—Attempt **all** questions. All questions carry equal marks.

1. Attempt any **two** questions :

    (a) (i) Discuss the limitation of Lamport's logical clock with suitable example.

    (ii) Give the Chandy-Lamport's global state recording algorithm.

    (b) Discuss vector clocks. Explain the implementation rules for vector clock. Give the vector time stamp of messages for following examples, where s1, s2 and s3 represent sites.
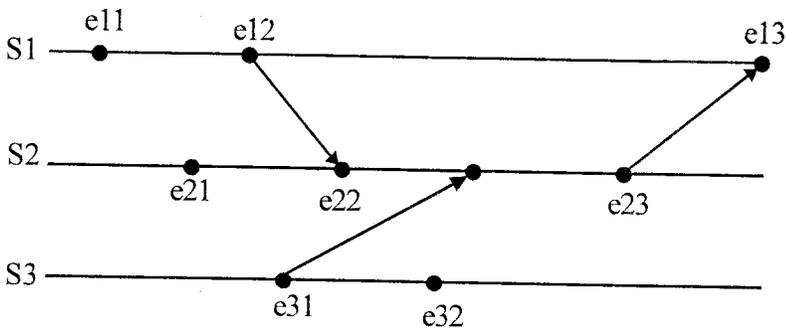
(c) Discuss causal ordering of messages. Give any algorithm which can order the messages according to causal dependencies.

2. Attempt any **two** questions :

(a) (i) Approaches based on shared variable (like semaphore) are not applicable to achieve mutual exclusion in distributed system. State whether this statement is correct or not and give the reasons behind it.

(ii) Explain the Ricart-Agrawala algorithm for mutual exclusion. How many messages per critical section execution are required ? (Assume there are N sites).

(b) Suppose all the processes in the system are assigned priorities that can be used to totally order the processes. Modify Chandy et al.'s (edge chasing algorithm) so that when a process detects a deadlock, it also knows the lowest priority deadlocked process.

(c) Discuss following :

(i) Performance metric for distributed mutual exclusion algorithms.

(ii) Obermarck's Path-Pushing algorithm.

3. Attempt any **two** questions :

(a) (i) Show that Byzantine agreement can not always be reached among four processors if two processors are faulty.

(ii) Show how a solution to the consensus problem can be used to solve the interactive consistency problem.

(b) In the context of distributed file system explain following :

(i) Mounting   (ii) Caching

(iii) Hints   (iv) Bulk Data transfer

(c) Explain the read replication and full replication algorithm for implementing distributed shared memory.

4. Attempt any **two** questions :

(a) With reference to the backward error recovery explain the Operation based approach and State based approach.

(b) Nonblocking commit protocol is not resilient to multiple site failures, communication failures and network partitioning because when a site is unreachable, the coordinator sends messages repeatedly and eventually may decide to abort the transaction. However, it is desirable that the sites continue to operate even when other sites have crashed, or at least one partition should continue to operate after the system has been partitioned. Generate an algorithm which can deal above problems.

(c) Write short notes on :

(i) Method to obtain consistent set of checkpoints

(ii) Domino effect.

5. Attempt any **two** questions :

(a) Discuss the optimistic methods for distributed concurrency control. What are the different validations conditions for optimistic concurrency control ? Explain it.

(b) How will you execute the transaction when data is replicated among several sites and data consistency is highest criteria ? Also discuss the case when data availability is highest criteria.

(c) Write short notes on :

(i) Flat and nested transaction

(ii) 2PL and strict 2 PL.