TWO MARKS

1. What do you mean by clock skew and clock drift?

- **Clock skew** – Instantaneous difference between the readings of any two clocks is called clock skew. Skew occurs since computer clocks like any others tends not be perfect at all times.

Clock drift – Clock drift occurs in crystal based clocks which counts time at different rates and hence they diverge. The drift rate is the change in the offset between the clock and a nominal perfect reference clock per unit of time measured by the reference clock.

2. What do you mean by Coordinated Universal Time?

Coordinated Universal Time generally abbreviated as UTC is an international standard for timekeeping. It is based on atomic time. UTC signals are synchronized and broadcast regularly from land based radio stations and satellites covering many parts of the world.

3. Define External Synchronization.

Generally it is necessary to synchronize the processes' clocks C_i with an authoritative external source of time. It is called as External Synchronization. For a synchronization bound D>0, and for a source S of UTC time, $| S(t) - C_i(t)|<D$ for i=1,2..N for all real times t in I where I is the time interval.

4. When an object is considered to be garbage?

An object is considered to be garbage if there are no longer any references to it anywhere in the distributed system. The memory taken up by the object can be reclaimed once it is known to be garbage. The technique used here is distributed garbage collection.

5. What do you meant by Distributed debugging?

In general, distributed systems are complex to debug. A special care needs to be taken in establishing what occurred during the execution. Consider an application with a variable x_i(i=1,2..N) and the variable changes as the program executes but it is always required to be within a value $ of

one other. In that case, relationship must be evaluated for values of the variables that occur at the same time.

6. Define marker receiving rule.

Snapshot algorithm designed by Chandy and Lamport is used for determining global states of distributed systems. This algorithm is defined through two rules namely marker sending rule and marker receiving rule. Marker receiving rule obligates a process that has not recorded its state to do so.

7. Define marker sending rule.

Snapshot algorithm designed by Chandy and Lamport is used for determining global states of distributed systems. This algorithm is defined through 2 rules namely marker sending rule and marker receiving rule. Marker sending rule obligates processes to send a marker after they have recorded their state ,but before they send any other messages.

8. Define the characteristics of serial equivalent transactions.

For any pair of transactions, it is possible to determine the order of pairs of conflicting operations on objects accessed by both of them. Read and write are the operations generally considered. For two transactions to be serially equivalent it is necessary and sufficient that all pairs of conflicting operations of the two transactions be executed in the same order at all of the objects they both access.

9. What are the advantages of nested transactions?

The outermost transaction in a set of nested transactions is calle 5/12 transaction. Transactions other than the top level transaction ..... .d subtransactions.
Advantages of nested transactions are:
- Subtransactions at one level may run concurrently with other subtransactions at the same level in the hierarchy. This can allow additional concurrency in a transaction.
- Subtransactions can commit or abort independently.

10. What are the rules of committing nested transactions?

Rules for committing of nested transactions are:
- A transaction may commit or abort only after its child transactions have completed.
- When a subtransaction completes, it makes an independent decision

either to commit provisionally or to abort.
- When a parent aborts, all of its transactions are aborted.

When a subtransaction aborts, the parent can decide whether to abort or not

11. Write short notes on strict two phase locking

A simple mechanism of a serializing mechanism is the use of exclusive locks. Under a strict execution regime, a transaction that needs to read or write an object must be delayed until other transactions that wrote the same object have committed or aborted. To enforce this rule, any locks applied during the progress of a transaction are held until the transaction commits or aborts. This is called *strict two-phase locking*. The presence of the locks prevents other transactions reading or writing the objects.

12. Define the approach of two phase commit protocol.

Two phase commit protocol is designed to allow any participant to abort its part of a transaction. In the first phase of the protocol, each participant votes for the transaction to be committed or aborted. In the second phase of the protocol, every participant in the transaction carries out the joint decision

16 marks
1. List the agreement statement that should be followed in synchronous system with failure?
2. Illustrate briefly the two kinds of checkpoints for checkpoint algorithm?
3. Discuss the issues of failure recovery with an example?
4. Illustrate the different types of failure in distributed systems?