M. Tech. Computer Science & Engineering (CBCS Pattern) Sem-I

PCSS12 - Advance in Operating System Design

P. Pages : 2 **GUG/W/22/10941**

Time : Three Hours * 1 7 4 2 * Max. Marks : 70

Notes : 1. All questions carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.
5. Solve **any five** questions.

1. a) Consider a distributed environment with four systems, A, B, C and D. Name the type of transparencies required in each of the following situations. **8**
i) Data available at all four systems and user want to modify the data at D.
ii) Printer connected to A is disconnected and connected to B. User wants to access that printer.
iii) Breakdown of system, D.
iv) User wants to access the software X without knowing its whereabouts.

b) What are the differences between the synchronous and asynchronous models of distributed systems? In which type of systems it is easier to write applications? Why? **6**

2. a) What are the various issues of distributed file system need to address by designers? Explain what is meant by stateful and stateless server. What are the advantages and disadvantages of both? What are the different kind of file sharing semantics? How can we implement cache coherence? **8**

b) What is marshalling and unmarshalling? Why it is required? How it is implemented? **6**

3. a) Suppose in Lamport's logical clock each node I increment its clock by a fixed positive constant di on an event (instead of incrementing by 1). Will the clock works correctly if the di's are different for different i? Justify your answer. **8**

b) Why does the Chandy-Lamport Global Sate collection algorithm require that the channels should be FIFO? How can we implement this algorithm in the real-world where the channels are not FIFO? **6**

4. a) Differentiate implementation rules of Vector clock and Lamport's clock. **8**

b) What do you understand by external and internal clock synchronization? What is fault tolerant averaging? How it is used in these schemes of clock synchronization? **6**

5. a) What are the safety and liveness requirements in the context of the leader election algorithm? Does the bully algorithm ensures safety and liveness? If yes give an informal proof, otherwise give a counter example. Is the safety requirement satisfied even during the course of the execution of the algorithm? **8**

b) How deadlock situation is handled in Meakawa's DME algorithm? **6**

6. a) In the Bully algorithm, a recovering process starts an election and will become the new coordinator if it has a higher identifier than the current incumbent. Is this a necessary feature of the algorithm? – Elaborate with suitable example. **8**

b) Explain Ricart-Agrawala's DME algorithm. **6**

7. a) Consider a centralized deadlock detection scheme in which a control site periodically requests local wait-for-graph from all the nodes in the system. It construct a global wait-for-graph and performs cycle detection to declare deadlocks? Is this scheme correct? If yes, prove its correctness. If no, give a counter example. **8**

b) Differentiate clearly between resource and communication deadlocks. Does an existence of a cycle in the WFG (wait for graph) indicate a communication deadlock? Briefly explain. **6**

8. a) In the static voting scheme for fault tolerance using replicated data, why the following two conditions are necessary? **8**

$r + w > v$ and $w > v / 2$

Where r and w are the read and write quorums respectively and v is the total number of votes assigned to the replicas.

b) What are the kinds of faults that can be handled and those that cannot be handled by the two phase commit protocol? Can the protocol handle simultaneous failures of two sites? **6**

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