

M.TECH/CSE/1ST SEM/CSEN 5142/2018
DISTRIBUTED SYSTEMS
(CSEN 5142)

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

*Candidates are required to give answer in their own words as far as
practicable.*

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) In distributed system, logical clock is associated with
(a) each register (b) each processor
(c) each instruction (d) none of the above.
- (ii) According to Ricart Agarwal's algorithm if both processes P1 and P2 want to execute the critical section, then P2 will reply to the request of P1
(a) always (b) if timestamp of P1 < P2
(c) if timestamp of P1 > P2 (d) when P2 has finished.
- (iii) Which of the following is for global snapshot algorithm?
(a) Chandy Lamport (b) Lamport's logical clock
(c) Ricart-Agarwal (d) none of these.
- (iv) To design a distributed file system _____ transparency is required.
(a) replication (b) access (c) naming (d) all of these.
- (v) If one site fails in distributed system
(a) the remaining sites can continue operating
(b) all the sites will stop working
(c) directly connected sites will stop working
(d) none of these.
- (vi) Phantom deadlock occurs in the distributed system only when there is
(a) false cycle (b) false path (c) false knot (d) none of these.
- (vii) Processes in distributed system normally communicate by using
(a) shared data approach (b) message passing approach
(c) none of these (d) all of these.

M.TECH/CSE/1ST SEM/CSEN 5142/2018

- (viii) If a is the event of sending a message in process P1 and b is the event of receiving the same message in process P2, which of the following relation is true?
(a) $C_i(a) < C_i(b)$ (b) $C_i(a) < C_j(b)$
(c) $C_i(a) > C_j(b)$ (d) $C_i(a) = C_j(b)$.
- (ix) A cycle in LWFG indicates that
(a) there is the possibility of a local deadlock
(b) there is the possibility of a global deadlock
(c) a deadlock has occurred locally
(d) a deadlock has occurred globally.
- (x) An example of token-based algorithm is
(a) Ricart-Agarwal (b) Suzuki Kasami
(c) Maekawa (d) none of these.

Group – B

2. (a) What is migration transparency in distributed systems? Discuss advantages of distributed systems. **2 + 3 + 7 = 12**
(b) Explain using an example how Lamport's logical clocks is used to implement totally-ordered multicasts in distributed systems.
3. (a) Discuss the fundamental issues in distributed system. Why global state detection is an issue in distributed system?
(b) What are casually related events? Explain Lamport's logical clock. What are the limitation of the Lamport's logical clock? **(3 + 2) + (1 + 3 + 3) = 12**

Group – C

4. (a) Write and explain Suzuki-Kasami's algorithm to achieve mutual exclusion.
(b) Discuss Maekawa's mutual exclusion algorithm and also explain the message complexity of it. **6 + 6 = 12**
5. (a) Why binding server is required in remote procedure call (RPC)? What do you mean by marshalling and unmarshalling?
(b) Discuss at-most once call semantic. Explain four messages reliable IPC protocols. **(3 + 4) + (2 + 3) = 12**

Group - D

6. (a) How replication can enhance the availability of files in distributed file system? State the potential problems with replication. Differentiate between load balancing vs. load sharing.
- (b) With diagram, explain data access action in distributed file system.

$$(2 + 3 + 2) + 5 = 12$$

7. (a) Why cache is employed in the distributed file system? State the necessity of mounting mechanism of a distributed file system?
- (b) Briefly describe the NFS architecture. What are the objectives of load balancing? What is the advantage of sender initiated algorithm over receiver initiated algorithm?

$$4 + (4 + 2 + 2) = 12$$

Group - E

8. (a) What do you mean by fragmentation transparency and local mapping transparency? How many message transfers are required for a global update operation that has agents at n sites with a centralized lock manager?
- (b) How are distributed two- phase locking protocol and 2PC protocol related to each other? What is the difference between parallel database and distributed database? Describe wound-wait protocol.

$$(4 + 2) + (1 + 2 + 3) = 12$$

9. (a) What is the difference between centralized and hierarchical deadlock detection? What is false deadlock? What are the rules which must be followed when defining fragmentation?
- (b) Consider the following global schema, fragmentation schema, allocation schema
 global schema: Guest(G_ID, name, block_ID, room_no)
 fragmentation schema:
 F1: $\sigma_{\text{block_id}=\text{"North"}}$ (Guest) F2: $\sigma_{\text{block_id}=\text{"South"}}$ (Guest)
 allocation schema: F1 at site 2 and F2 at site 1
 Write a query that accepts G_ID from user and output the name at level 1,2 and 3 of transparency.

$$(3 + 2 + 2) + 5 = 12$$