

CSE 1817 OE 31

Roll No. of candidate

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3/3/22

2021

MINA CHOWDHURY CENTRAL LIBRARY
(GIMT & GIPS) Ltd
Area, Hattin, Aspara,
Kolkata - 751017

B.Tech. 7th Semester End-Term Examination

CSE

DISTRIBUTED SYSTEMS

(New Regulation w.e.f. 2017 – 18 & New Syllabus w.e.f. 2018 – 19)

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks
for the questions.

Answer question No. 1 and any *four* from the rest.

1. Answer the following (MCQ/ Fill in the blanks) : (10 × 1 = 10)
- (i) In a distributed system, each processor has its own
 - (a) Clock
 - (b) Local memory
 - (c) Both local memory and clock
 - (d) None of the above
 - (ii) What is the common problem found in Distributed systems?
 - (a) Process Synchronization
 - (b) Communication synchronization
 - (c) Deadlock problem
 - (d) Power failure
 - (iii) The characteristics of the tightly coupled system are
 - (a) different clock
 - (b) use communication links
 - (c) same clock
 - (d) distributed systems

[Turn over

- (iv) In message-passing systems, a message-passing facility provides at least two operations
- (a) send (message) and delete (message)
 - (b) delete (message) and receive (message)
 - (c) write (message) and read (message)
 - (d) send (message) and receive (message)
- (v) Single-unit request model is a particular case of the _____ request model.
- (vi) Lamport's non-token-based algorithm can be optimized by suppressing _____ messages in certain situations.
- (vii) _____ command creates and starts a remote object registry on the specified *port* on the current host.
- (viii) When any single application function or component fails, then the entire application goes down
- (a) Microservices
 - (b) Macroservices
 - (c) Monolithic
 - (d) All of the above
- (ix) In case of failure, a new transaction coordinator can be elected by
- (a) Bully algorithm
 - (b) Ring algorithm
 - (c) Both bully and ring algorithm
 - (d) None of the mentioned
- (x) The deadlock handling in distributed system is highly focused towards deadlock detection methods. Because
- (a) Once a cycle is formed in the state graph, it persists until it is detected and broken.
 - (b) Deadlock avoidance is impractical in distributed systems.
 - (c) Deadlock prevention is inefficient because it decreases system concurrency
 - (d) All of the above

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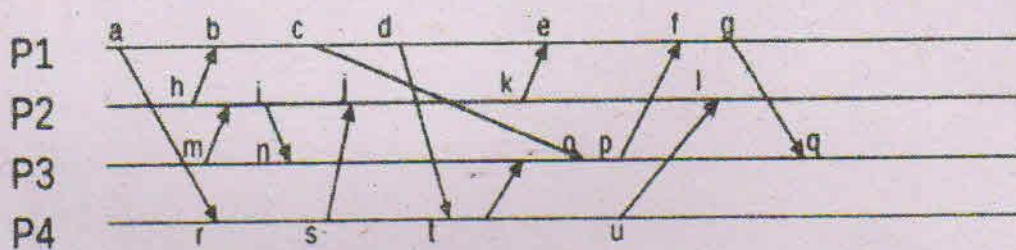
2. (a) "The causal ordering of messages helps to develop the distributed algorithm." Discuss this statement by explaining with a relevant protocol. (7)
- (b) Discuss the inherent limitations of distributed systems and their impact on the design and development of the system. (8)

3. (a) Illustrate the following terminologies:

- (i) inconsistency between two local states (5)
- (ii) strongly consistent global state (5)

(b) The following figure shows four processes (P1, P2, P3, P4) with events a,b,c,u and message events communicating between them. Considering all initial logical clock values as 0.

- (i) List the Vector Clock timestamps for each event shown in the figure below. Provide timestamps for each labeled event. (7)
- (ii) List the events that are concurrent and explain why? (7 + 3 = 10)



4. (a) Explain the Chandy-Mishra-Haas's AND request model in a distributed deadlock detection. (8)
- (b) What are two conditions that must be satisfied by a correct deadlock detection algorithm? Discuss in detail. (7)
5. (a) Differentiate between flat and nested distributed transactions with the help of diagram. (5)
- (b) What are the different timestamp-based locking algorithms for concurrency control used to resolve the conflicts in a distributed database systems. (10)

6. (a) Show that the critical section is accessed according to the increasing order of time stamps in the Recart-Agrawala algorithm. (7)
- (b) Maekawa's algorithm is prone to deadlock. Explain the details of deadlock handling steps using three types of messages. What is the maximum number of messages required per critical section execution in this case? (7+1=8)
7. (a) Discuss and compare the performance of distributed token and non-token based mutual exclusion algorithms specially under light load and heavy load conditions. (8)
- (b) What is distributed shared memory? Illustrate some advantages of it. (3+4= 7)

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