

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Distributed System

Semester: Spring

Year: 2020
Full Marks: 70
Pass Marks: 31.5
Time : 2 hrs.

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

Attempt all the questions.

1. Definition of distributed system says that it is completely hidden from users that there even multiple computers. Elaborate the above statement. Give few distinct and contrasting examples of the increasing levels of heterogeneity in today's distributed systems. Illustrate the following statement with suitable real life example. "Middleware is used to mask the heterogeneity". 4+3+3

2. List and explain few application why those applications uses blocking and non-blocking message passing system. In which situation we can use asynchronous RPC? Before transmission, Sun XDR marshals data by transforming it to a standard big-endian format. Compare and contrast the benefits and drawbacks of this technique with CORBA CDR. 4+3+3

3. Why is it required to synchronize computer clocks? Describe the design criteria for a clock synchronization system in a distributed system. A client makes an attempt to sync with a time server. In the table below, it records the round-trip times and timestamps returned by the server. Which of the following times should it set its clock to? What should the time be set to? Calculate the setting's accuracy with relation to the server's clock. If it is known that the time between sending and receiving a message in the system concerned is at least 10 ms, do your answers change? 2+3+5

Round trip time(ms)	Time(hr:mm:ss)
24	11:52:20.674
25	11:52:26.450
22	11:52:22.342

4. How do we enforce the global ordering requirement in a distributed environment (without a common clock)? Consider the ring based leader election algorithm with 7 processes (P0, P1, P2, P3, P4, P5, and P6) are arranged in a logical ring such that the clockwise orientation of processes a $P0 \rightarrow P5 \rightarrow P4 \rightarrow P6 \rightarrow P3 \rightarrow P1 \rightarrow P2 \rightarrow P0$. Assume that process P6 is the leader and crashes. Further, assume that processes P1, P4 and P2 notice this crash and initiate simultaneous elections. Explain the optimized way to select the leader. 10
5. What is the meaning of synchronization in distributed system and why it is always not possible to do? Compare Lamports, Ricart Agarwala and Ricart Agarwala Second algorithm for distributed mutual exclusion on the basis of number of message required, reliability, failure handling and execution mechanisms for each critical section execution. 2+8

6. Why 2 phase commit protocol is widely used than 3-phase commit protocol. 3+9+8

A server manages the objects a_1, a_2, \dots, a_n . The server provides two operations for its clients:

read (i) - returns the value of a_i

write(i , Value) – assign the value to a_i

The transactions T and U are defined as follows:

T: $x = \text{read}(j)$; $y = \text{read}(i)$; $\text{write}(j, 44)$; $\text{write}(i, 33)$;

U: $x = \text{read}(k)$; $\text{write}(i, 55)$; $y = \text{read}(j)$; $\text{write}(k, 66)$.

Give **three** serially equivalent interleaving's of the transactions T and U.

Also, Give serially equivalent interleaving's of T and U with the following properties:

- i. that are strict;
- ii. that are not strict but could not produce cascading aborts;
- iii. that could produce cascading aborts.