3E7937

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M. Tech. III - Sem. (Main / Back) Exam., Feb.- March - 2021
Computer Engineering
3MCS1 Parallel and Distributed Computing

Time: 2 Hours **[To be converted as per scheme]**

Max. Marks: 60

Min. Marks: 20

Instructions to Candidates:

Attempt any three questions. Marks of questions are indicated against each question. Draw neat and comprehensive sketches wherever necessary to clearly illustrate your answer. Assume missing data suitable if any and specify the same. Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL

2. NIL

Q.1 (a) Briefly explain the communication primitives of a client server working in a non – blocking mode. [8]

(b) In the non – blocking mode, a call to 'send' gets completed before the message is actually sent. Imagine that, to reduce the overhead, the data are not copied to kernel but directly sent to user space. Suggest a method, such that the sender can be told transmission is complete, hence the buffer can be reused. [8]

(c) Why a client-server model cannot be used to build distributed processing? Explain. [4]

Q.2 (a) Why is there a need of concurrency control? What is optimistic concurrency control? Is it more or less restrictive than using the time – stamps? [10]

(b) What is serializability in concurrency control? Explain. [10]

[200]

Q.3 (a) What is happen – before relation? Explain its significance in a distributed system. [10]

(b) Let there be three terminals for editing programs that are editing the programs input.c, output.c, and main.c respectively. The 'make' program is used to create object files on the server. All these files have time – stamp of their creation time, so that if time – stamp of .o file is less than .c file, the corresponding file is compiled again by the 'make' program. Explain using timing diagram, as how the compiled program will work in a bad way if one of the local clocks of computer is running slow. [10]

Q.4 (a) How is the mutual exclusion implemented using a centralized algorithm? Explain the steps. What are the drawbacks of this method, if any? [8]

(b) If the coordinator in centralized mutual exclusion crashes, does it always bring the system down? If not, under what circumstances this happens? [6]

(c) Explain a distributed algorithm for mutual exclusion, and show that there is neither a deadlock nor a starvation. [6]

Q.5 (a) Explain, how to maintain the Logical Clocks using the Lamport's Algorithm. [10]

(b) Consider the behavior of two machines in a distributed system. Both have clocks that are supposed to tick 1000 times per millisecond. One of them actually does ticks correctly, but the other ticks only 990 times per millisecond. The UTC (Universal Coordinated Time) updates come in once a minute. What is the maximum clock skew that will occur? [10]

[200]

Q.6 (a) What do you mean by atomicity of a transaction? Why is there a need to attain the atomicity? [8]

(b) Explain the distributed algorithm for mutual exclusion and justify that it is not affected by centralized failure. [6]

(c) Explain the 2 – phase commit protocol (2PC) for committing transactions? Why 2PC protocol is foolproof? [6]

Q.7 (a) Why deadlock occurs? Give examples of deadlock in a centralized system and distributed systems. [8]

(b) Why is it challenging to detect a distributed deadlock? Explain a method for distributed deadlock detection. [6]

(c) Suggest means to prevent/minimize the distributed deadlock. [6]

Q.8 (a) Why is the clock synchronization challenging in distributed systems? [5]

(b) Explain the difference between physical and logical clocks. [5]

(c) What is compensating delay in clocks used in distributed system? How is it computed? [5]

(d) Briefly describe the vector clocks and matrix clocks used in distributed systems. [5]
