MAASAI MARA UNIVERSITY

2018/2019ACADEMIC YEAR

SECOND SEMESTER EXAMINATION

FOR THE THIRD YEAR SECOND

SEMESTER BACHELOR OF SCIENCE IN

COMPUTER SCIENCE

COURSE CODE: COM   3208
COURSE TITLE: DITRIBUTED SYSTEMS

DATE : 24TH APRIL 2019   TIME: 14.30 - 16.30 HRS

INSTRUCTIONS:
SECTION A IS COMPULSORY ATTEMPT TWO QUESTIONS IN SECTION B

QUESTION ONE [30 MARKS]

A. In Cristian's Algorithm, a client asks for the current time from the server. The server responds with 6:00PM. The network round trip time measured by the client is 7 s. The minimum one-way transmission time from the client to the server is 2 s and the minimum one-way transmission time from the server to the client is 1 s. What are the two extreme cases of time? What time does the client set its clock to? Briefly justify your answer. **[5 marks]**

B. Suppose we wish to implement a transaction processing system that maintains ACID properties even in the presence of crashes. In event of a crash, any information stored on disk can be retrieved, but any data stored in memory will be lost.

Briefly describe one serious shortcoming of each of the following implementations: **[3 marks]**

 i. The database is updated on disk with each transaction
 ii. The database is kept in memory and on disk, with the copy on disk updated every 50 transactions.
 iii. The database is kept in memory. A log file is maintained on disk recording every transaction.

C. Cloud computing services like Amazon's EC2 assign users virtual machines (VMs) instead of allocating physical machines directly. Doing so provides at least three major benefits to Amazon. Explain what these three benefits are, giving a brief motivation for each one. **[3 marks]**

D. Consider the following modification to the Bully algorithm that elects two leaders by choosing the alive processes with the two highest identifiers.

_ To start an election, a process send a message to all processes with higher numbers.

_ If the process receives no replies after a timeout, it declares itself the first leader and sends a coordinator 1 message to all the lower-numbered processes.

_ If the process receives exactly one reply, it declares itself the second leader and sends a coordinator 2 message to all the lower-numbered processes, as well as the first leader.

_ If a process receives more than one reply, it waits to receive coordinator 1 and coordinator 2 messages ,and restarts the election after a timeout if it does not receive them.

_ When a process receives a message from a lower-numbered process, it sends a reply and starts a new election.

  (i) What is the number of messages sent in the worst-case execution of this protocol, assuming that no processes fail during the execution?   **[5 marks]**

  (ii) Assuming a one-way delay of T, what is the worst-case turnaround time, assuming that no processes fail during the execution? Assume that processing is instantaneous.   **[5 marks]**

(iii) Under what condition would this protocol fail to elect two leaders? How would you fix it?

[9 marks]

SECTION B

QUESTION TWO   **[20 MARKS]**

A. Explain types of transparencies   **[16 marks]**

B.. Discuss four factors common in most middleware   **[4 marks]**

QUESTION THREE   **[20 MARKS]**

 A. Explain five issues considered in the designing of distributed systems   **[10 marks]**

 B. There are several paradigms commonly used to structure a distributed system. Discuss
    the paradigms   **[10 marks]**

QUESTION FOUR   **[20 MARKS]**

A. State the characteristics of a distributed algorithms   **[4 marks]**

 B. Explain the application of distributed systems in kenya   **[8 marks]**

C. Explain the main strategies for handling deadlocks **[4 marks]**

D. Name four characteristics of Distributed systems **[4 marks]**

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