2020
Subject: Computer Science
Paper Code & Name: CSM302 – Advances in Operating System

Full Marks: 70

Date: 12.03.2021   **Time and Duration: 12pm to 3pm**

Please follow the instructions below carefully:
The figures in the margin indicate full marks
Promise not to commit any academic dishonesty.
Marks will be deducted if the same/similar answers are found in different answer-scripts.
Candidates are required to answer in their own words as far as applicable.
Each page of the answer scripts should have your University Roll # on the right-top corner.

The name of the scanned copy of the answer script will be of the following format:
                    (Example: CSM-302-AOS-My Roll Number.pdf)
The subject of the mail should be the file name only.

The name of the scanned answer-script is to be sent to cucse2020@gmail.com
The report should have the top page (Page #1) as an index page; mention page number(s) against the answer of each question number.
The answer-script may not be accepted after the scheduled time.

Answer Question No. **1, 2**, and **any Four** from the rest.

1. Answer any five (5) out of the following:
   a) Define the local and global states of a system.
   b) What is access transparency?
   c) What is the role of IDL (interface definition language) in RPC?
   d) Define user mobility in a distributed system.
   e) What is a distributed file system?
   f) Why token-based algorithms are said to be inherently safe?
   g) What would be the nature of a global state recording curve on the time line of an event trace diagram?
   h) What is marshalling and un-marshalling?

                                                                                    2x5=10

2. Comment on the correctness of the following statements and justify your opinion - answer any five (5):
   a) "A clock cannot be taken back for the sake of synchronization in a distributed system."
   b) "Raymond's algorithm may grant access to processes out of turn."
   c) "Migration of resources is a greater concern than address-space migration."
   d) "Symmetric algorithms involve lower communication overhead in comparison with the diffusion computation approach."
   e) "Recording Global State for a distributed system is impossible."
   f) "*Call by Reference* is best suitable for RPC."
   g) "It's easier to achieve semantic transparency as compared to syntactic transparency for a distributed system."

                                                                                    4x5=20

3. a) What is symmetric algorithm?
    b) Define correctness of control algorithms for a distributed system.
    c) What do understand by fairness property in a distributed system?
    d) Somebody suggested that a greedy algorithm can be developed by modifying Ricart-Agrawala algorithm such that a process P_i wishing to enter its critical section does not send a "go ahead" reply to any other process till P_i itself has used its critical section. Give your views on the correctness of the revised algorithm.

                                                            2+2+2+4=10

4. a) Describe a token-based algorithm to ensure mutual exclusion of processes run from multiple nodes in a distributed system connected using a hierarchical topology.
    b) What would be the worst-case complexity for the above algorithm for a system with N processes running in that many nodes?
    c) Compare performances of symmetric algorithms vis-a-vis token-based algorithms for mutual exclusion.

                                                            6+1+3=10

5. a) Define cut of a system.

   b) What are forward and backward intersections?

   c) The following events occur in a system of three processes:

process p1	process p2	process p3
event e1;	event e4;	event e6;
send message to p2;	receive message from p3;	send message to p2;
event e2;	receive message from p1;	event e7;
event e3;	event e5;	receive message from p2;
	send message to p3;	event e8;

   i) Draw a valid timing diagram (event trace diagram) for the system.

   ii) Show the event precedence in the system.

   iii) List the concurrent events.

                                                            2+2+6=10

6   a) State at least two different motivations behind process migration.

    b) Describe the sender-initiated process migration approach.

    c) What is stability? What is done to improve the stability of the system for sender-initiated process migration?

    d) Define preemptive and non-preemptive process migrations.   2+4+2+2=10

7. a) What are the drawbacks of the centralized deadlock detection algorithm?

   b) Describe Mitchell-Merritt algorithm for deadlock detection in a distributed environment. Illustrate the same with an example.

   3+7=10

8. a) Explain the role of stubs towards implementing RPC mechanism.

   b) What are the different components in typical request message for RPC?
   c) Explain the relative merits and demerits of using binding agents vis-à-vis binding by broadcasting requests from client side for implementing RPC system.
   d) What is an Orphan Call in RPC?

   3+2+3+2=10