M. **Sc., Semester – III Examination, 2021**

2021

Subject: Computer Science

Paper: CSM302 – Advances in Operating System

Full Marks: 70

Date: 19.01.2022 **Time: 12 pm to 3 pm**

Please follow the instructions below carefully.

The figures in the margin indicate full marks.
Candidates are required to answer in their own words as far as applicable.
Each Page of answer scripts should have your examination Roll Number on the right-side top corner of your answer script.
The name of the scanned copy of the answer script will be of the following format:
(Example: CSM302-AOS-My Roll Number.pdf)
The subject of the mail should be the file name only.
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.
Extra 30 minutes is allowed for uploading the answer script.
The answer script may not be accepted after the scheduled time.

Answer questions 1, 2 and any four from the remaining questions. All answers should be precise

Q.No. Marks

Q1. Answer any five (5) out of the following:
a) Define cut of a system.
b) Define replication transparency and access transparency for a distributed system.
c) What is the clock synchronization problem in a distributed system?
d) State at least two different motivations behind process migration.
e) What would be the nature of an ideal global state recording curve on the time-line of an event trace diagram?
f) What is marshalling in the context of Remote Procedure Call (RPC)?

2x5=10

Q2. Comment on the correctness of the following statements and justify your opinion - answer any five (5):
a) "Failure of liveness is not a major concern for deadlock detection algorithms."
b) "Vector clock provides only a partial order among time-stamps for different events in a distributed environment"
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) "Call-by-move optimizes performance over call-by-object-reference in parameter passing for RPC."
f) "Lamport's Clock model generates unique time stamp for each and every event in a distributed system"

4x5=20

Marks

Q3. a) Illustrate the Chandy-Lamport's algorithm for state recording with an example.
b) Why Chandy-Lamport's algorithm is often referred as distributed snapshot algorithm?
c) Given, two unrelated events X and Y occur in two different nodes. The time-stamp values for the two events following Lamport's logical clock are TS(X), and TS(Y) respectively such that TS(X) > TS(Y). May we infer that physically event Y has occurred before X? Justify your opinion.

4+2+4=10

Q4. a) Define correctness of control algorithms for a distributed system.
b) What would you infer on the correctness of Ricart-Agrawala's algorithm for mutual exclusion? Justify your opinion.
c) What would be the worst-case complexity of the above algorithm for a system with N processes running in that many nodes in the system?
d) What is fairness in the context of designing a mutual exclusion algorithm?

2+4+2+2=10

Q5. a) Define preemptive and non-preemptive process migrations.
b) Describe the hybrid approach for process migration. Comment on the performance of this approach.
c) Why deadlock avoidance is tough to achieve as a deadlock handling mechanism for distributed environment?

2+5+3=10

Q6. a) Discuss on the safety and liveness properties of Ho-Ramamurthy's deadlock detection algorithm.
b) Describe Mitchell-Merritt algorithm for deadlock detection in a distributed environment. Illustrate the same with an example.

4+6=10

Q7. a) Explain the role of RPC run-time towards implementing RPC mechanism.
b) Name the IDL for SUN RPC environment. What compiler is used for IDL in SUN RPC.
c) How binding is done for SUN RPC?
d) How an RPC of long duration may be handled?

3+2+3+2=10

Q8. a) Discuss the role of client stub towards implementing RPC mechanism.
b) Compare in brief among the last-one, exactly once, and at-least-once call semantics for RPC.
c) Suggest the appropriate call semantics to be used (among may-be, last-of-many, at-least-once or exactly-once) for the following application:
i. To request a time server to get the current time.
ii. To request a booking server to reserve a seat.

3+3+4=10