2019

COMPUTER SCIENCE

Paper : CSM-302

(Advances in Operating System)

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

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

1. Answer ***any five*** out of the following : 2×5

(a) What is global state of a system?

(b) Define access transparency.

(c) State at least two different motivations behind process migration.

(d) Why are token based algorithms said to be inherently safe?

(e) What would be the nature of a global state recording curve on the time-line of an event trace diagram?

(f) Define the condition for precedence between two events e_p and e_k.

(g) Name a cell semantics supported in SUN RPC implementation for synchronous mode of operation.

(h) State the condition for Happens Before relation between events.

(i) What are commonly used methods to solve thrashing problem in a DSM System?

2. Comment on the correctness of the following statements and justify your opinion–answer ***any five*** : 4×5

(a) *'Failure of liveness is not a major concern for deadlock detection algorithms'*

(b) 'Recording Global State for a distributed system is impossible'—

(c) 'Lamport's Clock model generates unique time stamp for each and every event in a distributed system'

(d) 'In a distributed system, resource migration is more challenging than migration of codes for a process'

(e) 'Call by reference is not a suitable option for parameter passing in RPC'

(f) 'Termination Detection using weight throwing approach maintains both safeness and liveness'

(g) 'Raymond's algorithm may grant access to processes'

3. (a) What is false sharing? Can this problem had to any other problem in a DSM system? Give reason for your answer.

   (b) What is stub? How stubs are generated? Explain how the use of stubs helps in making an RPC machanism transparent. (2+3)+(1+1+3)

4. (a) Define condition of consistency in terms of processes and channels in a distributed system.

   (b) State the assumptions and conditions for Lamport's logical clock model.

   (c) 'Two unrelated events X and Y occur in two different nodes. The Lamport's logical clock time-stamp values for the two events are TS(X), and TS(Y) respectvely such that TS(X) > TS(Y). It cannot be inferred from these statements that physically Y has occurred before X'— give your opinion on the validity of the statements above and justify the same. 3+3+4

5. (a) Describe a token based algorithm for mutual exclusion in distributed system.

   (b) What would be the best and worst-case control message complexity for the above algorithm for a system with N competing processes? Justify your assessment.

   (c) Compare symmetric algorithms vis-a-vis token based algorithms for mutual exclusion. 4+3+3

6. (a) Describe the Ho-Ramamurthy's deadlock detection algorithm for distributed environment. Illustrate the same with an example.

   (b) Comment on the safety and liveness properties of Ho-Ramamurthy's deadlock detection algorithm. 6+4

7. (a) Define pre-emptive and non pre-emptive process migration.

   (b) Name two alternate metrics that may be used to measure load in a node.

   (c) State two diffrent motivations for process migration other than load balancing.

   (d) State the merits and demerits of sender initiated versus receiver initiated process migration approaches. 2+2+2+4

8. (a) Explain the process of stub generation in SUN RPC using Interface Definition Language.

   (b) What is Orphan call? Why is it important to detect an Orphan Call?

   (c) What is the role of binding agent in RPC?

   (d) Suggest the appropriate call semantics to be used (among may-be, last-of-many, at-least-once or exactly-once) for the following applications.

   (i) To request a time server to get the current time;

   (ii) To request a booking server to reserve a seat;

   Present brief explanation for your choices in each of the cases. 3+1+2+(2+2)

9. Derive the D^-, D^+ and D matrices for the following Petri Net.

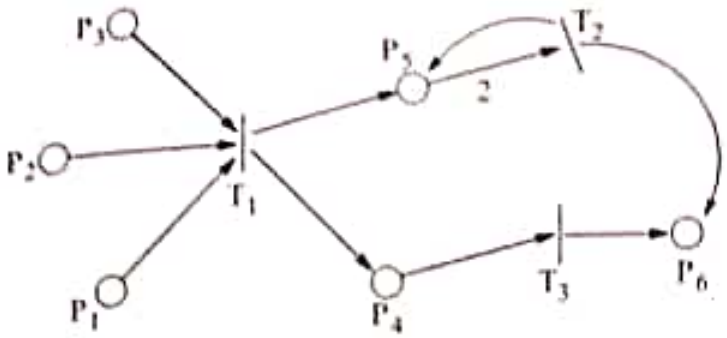

Fig-1 A Petri Net Model.

Given an initial marking of I_M = [4, 3, 3, 0, 1, 0], draw the reachability tree for the Petri Net in Fig-1 Is it possible to reach a state with 4 token in P_6 for the above initial marking? Justify your opinion and list the firing sequence for the transitions accordingly. 4+3+3