S20180010017
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Q.1.) A Distributed System is a ~~Concrete~~ Collection of • inter-connected memory isolated processes which communicate to each other by passing messages through channels in order to complete a task.

• parallel system has multiple cores/processors having a shared memory.

Q.2.)

a→ (R_0) [7] [9] [8] [6] [4] [5] [1]

(R,I): 7 — 9 — 6 — 8 — 4 — 5 — 1

(R II): 7 — 6 — 9 — 4 — 8 — 1 — 5

(R III): 6 — 7 — 4 — 9 — 1 — 8 — 5

(R IV): 6 — 4 — 7 — 1 — 9 — 5 — 8

(R V): 4 — 6 — 1 — 7 — 5 — 9 — 8

R(VI): 4 — 1 — 6 — 5 — 7 — 8 — 9

R(VII): 1 — 4 — 5 — 6 — 7 — 8 — 9

Q.2.

(b) R_0 : 7 — 9 — 8 — 6 — 4 — 5 — 1

RI: $\frac{7^0}{-1}$ — $\frac{9|9}{0}$ — $\frac{8|8}{0}$ — $\frac{6|6}{0}$ — $\frac{4|4}{0}$ — $\frac{5|5}{0}$ — $\frac{1^u}{1}$

RII: $\frac{7^0}{-1}$ — $\frac{8|9}{0}$ — $\frac{6|6}{0}$ — $\frac{4|8}{0}$ — $\frac{4|6}{0}$ — $\frac{1^u|5}{1}$ — $\frac{5}{1}$

RIII: $\frac{7^0}{-1}$ — $\frac{6|8}{0}$ — $\frac{4|9}{0}$ — $\frac{4|6}{0}$ — $\frac{1^u|8}{0}$ — $\frac{5|6}{1}$ — $\frac{5}{1}$

RIV $\frac{6}{-1}$ — $\frac{4|7^u}{-1}$ — $\frac{4|8}{0}$ — $\frac{1^u|9}{0}$ — $\frac{5|6}{0}$ — $\frac{5|8}{1}$ — $\frac{6}{1}$

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(b.)

R IV : 4 — 4/6 — 1^4/7^4 — 5/8 — 5/9 — 6/6 — 8
-1 -1 0 1 1 1 1

R V : 4 — 1^4/4 — 5/6 — 5/7^4 — 6/8 6/8 — 9
-1 -1 D

R VI 1^4 4/4 — 5/5 — 6/6 — 6/7^4 — 8/8 — 9

1^* 4 5 6 7^4 8 9

Q.3)

Global state

$$GS = \{ \cup_i LS_i^{x_i}, \cup_{j,k} SC_{jk}^{y_j, z_k} \}$$

Global state is defined as the collection of Local States and message channels of all processes.

The one necessary condition for a consistent global state is

$$\forall m_{ij} : send(m_{ij}) \notin LS_i^{x_i} \Leftrightarrow m_{ij} \notin SC_{ij}^{x_i, y_j} \wedge receive(m_{ij}) \notin LS_j^{y_j}$$

(b) i) D_1 is a Consistent cut & leads to a consistent state.

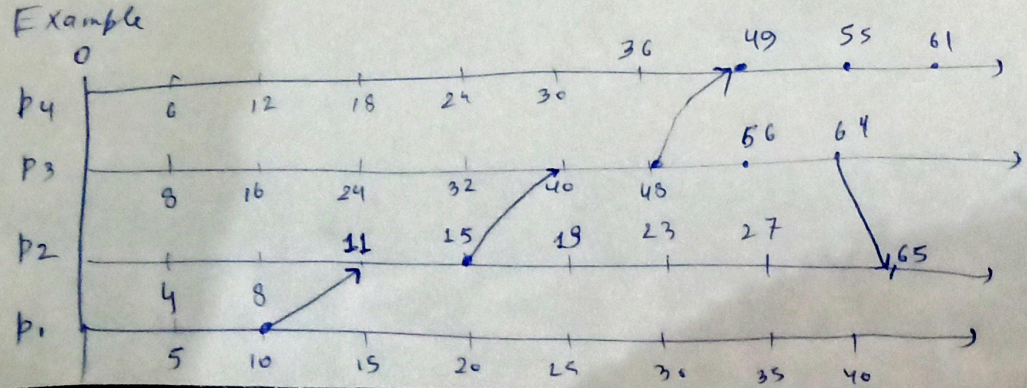
ii) D_2 is a Consistent cut.

iii) D_3 is not Consistent since it leads to situation that m_3 is received before sending.

Q.4.)

Lamport logical clock defines a seperate clock for each process and sends its logical time with the message. The recieving process chooses and updates it's time to the max of its local and recieved Time.

Example



Q.5.)

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(b) The Condition for termination detection are

i) All process must be idle.

2.) No pending messages in the Communication channels.

When any one of the process goes idle, it will initiate a local Snapshot and send request do other channels, when recieving process gets the snapshot Record message thy will will take their respective global Snapshot and the termination of the transaction will end with the process with the highest logical time.