PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Final Examination: Semester 1 **Academic Year**: 2006

Date: 8 October 2006 **Time**: 9.00-12.00 (3 hours)

Subject Number: 240-631 **Room**: R200

Subject Title: Parallel and Distributed Simulation Systems

Exam Duration: 3 hours

This paper has 13 pages, 12 questions and 130 marks (40%).

Authorised Materials:

- Writing instruments (e.g. pens, pencils).
- Textbooks, a notebook, handouts, and dictionaries are permitted.

Instructions to Students:

- Scan all the questions before answering so that you can manage your time better.
- Attempt all questions in Thai.
- Write your name and ID on every page.
- Any unreadable parts will be considered wrong.

When drawing diagrams or coding, use good layout, and short comments; marks will not be deducted for minor syntax errors.

NO	Time (Min)	Marks	Collected	NO	Time (Min)	Marks	Collected
1	60	30		7	10	10	
2	10	6		8	10	10	
3	15	8		9	10	10	
4	10	6		10	10	10	
5	10	10		11	10	10	
6	10	10		12	10	10	

ทุจริตในการสอบ

โทษขั้นต่ำ ปรับตกในรายวิชานั้นและพักการเรียน 1 ภาคการศึกษา

โทษสูงสุด ให้ออก

Name_____ ID_____

Question 1 (30 marks; 60 minutes)

a) What are the differences between *time parallel* and *space parallel* frameworks (2 marks)

Time parallel	Space parallel

b) What are the differences between *Global Virtual Time (GVT)* and *lower bound on the time stamp (LBTS)*? (2 marks)

GVT	LBTS

c) What are the differences between *Batch fossil collection and On-the-fly fossil collection*? (2 marks)

Batch fossil collection	On-the-fly fossil collection

d) What are the differences between *conservative* and *optimistic* algorithms in distributed simulation systems. (4 marks)

Conservative algorithms	Optimistic algorithms

e) What are the differences between *livelock* and *deadlock*. (2 marks)

livelock	deadlock

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f) What are the differences amongst the followings in terms of algorithms and usage. (4 marks)

Storage optimal protocols	Artificial Rollback

g) What are transient messages? And what impacts can they cause? (2 marks)

h) What are the benefits of a distance matrix? (2 marks)

i) Why *lookahead* is important? What can *lookahead* be derived from? (3 marks)

j) What are anti-messages for? (2 marks)

k) What are mark-acknowledges for? (2 marks)

l) How does the fossil collection deal with GVT in time warp? (1 mark)

m) How does message sendback work? And what is it for? (2 marks)

Question 2 (6 marks; 10 minutes)

What are the differences amongst the followings in terms of algorithm and usage.

- Event Retraction

- Lazy Cancellation

- Lazy Re-Evaluation

Question 3 (8 marks; 15 minutes)

What are the differences amongst the followings in terms of algorithm and tradeoff.

- Copy State Saving

- Infrequent State Saving

- Incremental State Saving

- Reverse Computation

Question 4 (6 marks; 10 minutes)

Explain the following problems and give a solution to solve the problems.

- Zero Lookahead,

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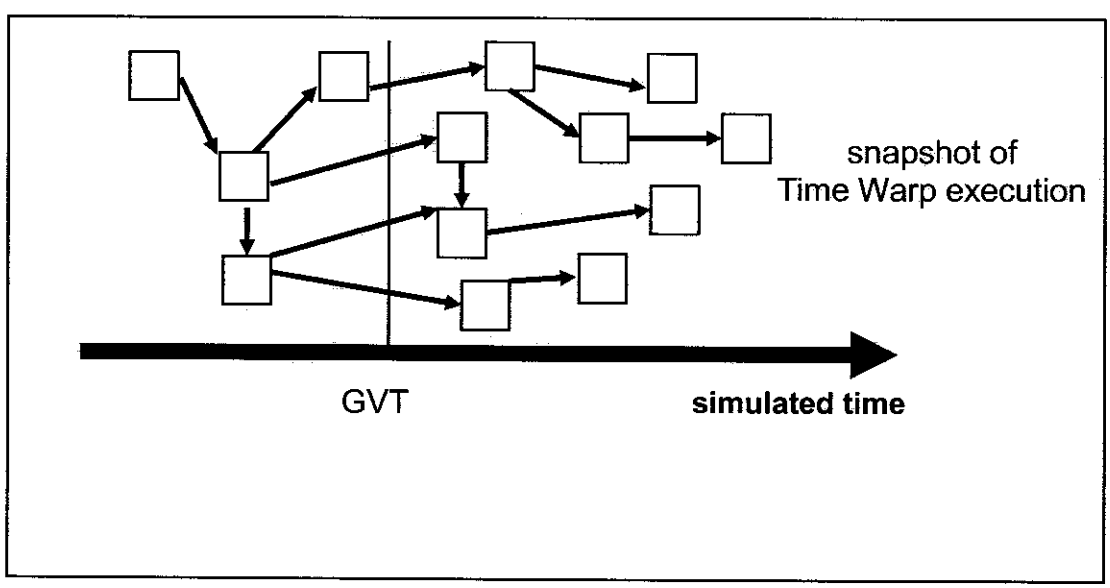
- Simultaneous Events

- Repeatability

Question 5 (10 marks; 10 minutes)

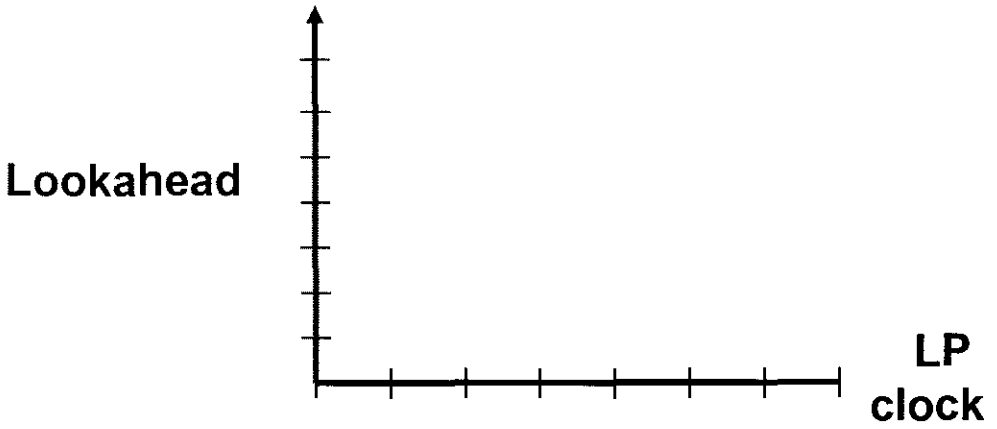
In case of Storage Optimal Protocols, color the above events in the following picture and tell which are eligible or ineligible for deletion and which events can storage be reclaimed.



Name_____ ID_____

Question 6 (10 marks; 10 minutes)

If a logical process is at simulation time 8 and lookahead is 4, use the below graph to help with answering the following questions.



a) The logical process has promised subsequent messages will have a time stamp of at least _____.

b) If lookahead were to increase to 5, what should be done?

c) If lookahead were to decrease to 2, what should be done?

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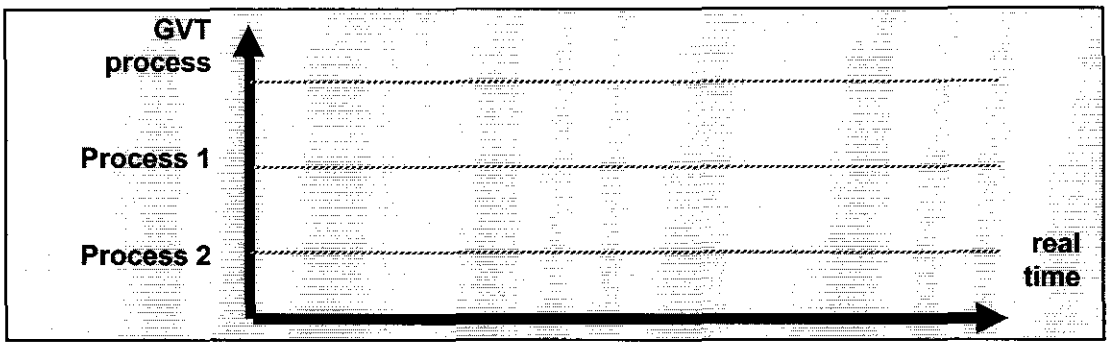
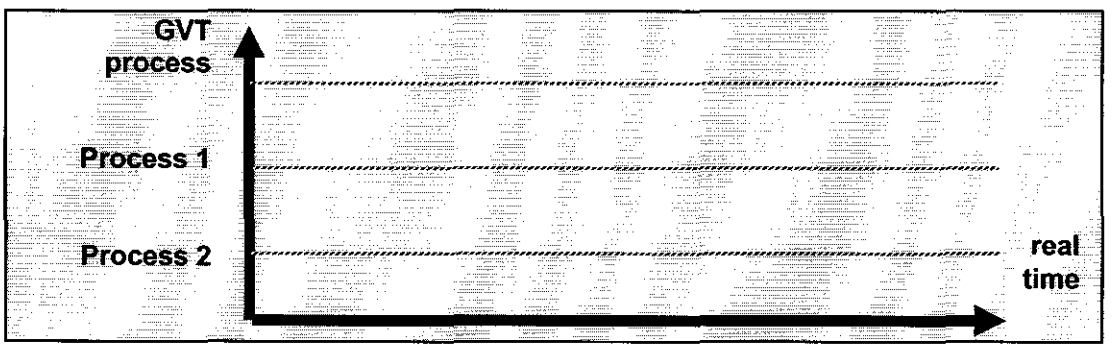
Question 7 (10 marks; 10 minutes)

Explain the following problems and show solutions to the problems in *Global Virtual Time* using diagrams.

a) transient message (5 marks)



b) simultaneous reporting (5 marks)

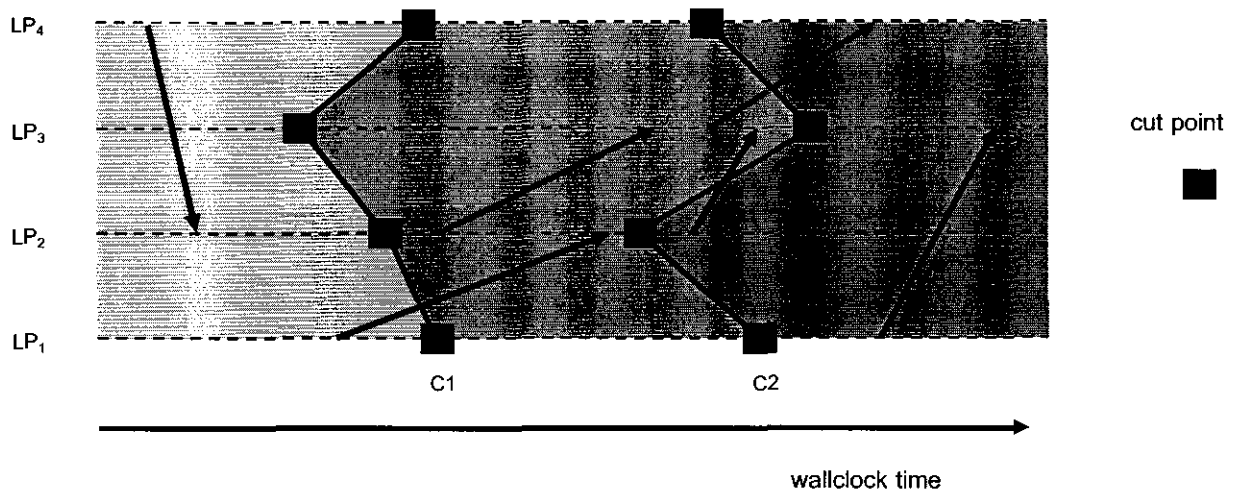


Name_____ ID_____

Question 8 (10 marks; 10 minutes)

a) What are the benefits of getting a Global Virtual Time (GVT) without sending a request and collecting reports from logical processes. (2 marks)

b) From the below picture, circle cut messages. (2 marks)



c) From the above picture, explain the use of each cut. (2 marks)

d) Tell what need to be collected in a token sent round the logical processes and the reasons why. (4 marks)

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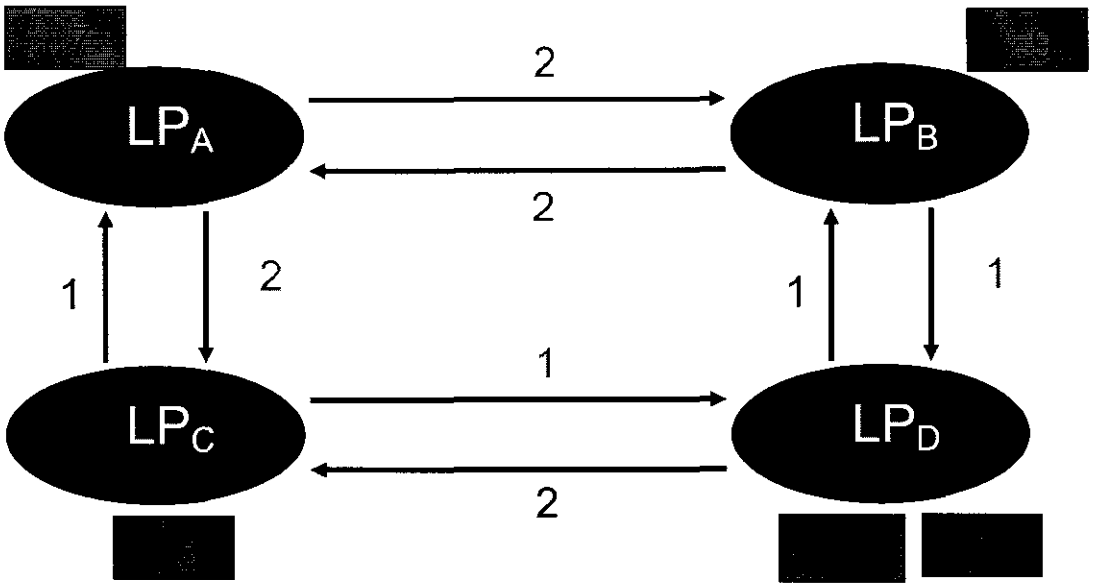
Question 9 (10 marks; 10 minutes)



a) From the above topology, fill in the following distance matrix.

(2 marks)

	A	B	C	D
A				
B				
C				
D				

b) Calculate the Lower Bound on the Timestamp (LBTS) on each logical process. (4 marks)

A	
B	
C	
D	

c) Which messages depend on which? (2 marks)

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Question 10 (10 marks; 10 minutes)

Given a below sequence of references to blocks in memory, determine number of hits and misses using Least Recently Used (LRU) stack replacement. Suppose that there are 4 processors and each stack can contain 4 addresses. Trace Drive Cache Simulation using Time Parallel Simulation: Relaxation Approach.

1 2 1 3 4 3 6 7 2 1 2 6 9 3 3 6 4 2 3 1 7 2 7 4

a) first iteration: assume stack is initially empty

1 2 1 3 4 3 6 7 2 1 2 6 9 3 3 6 4 2 3 1 7 2 7 4

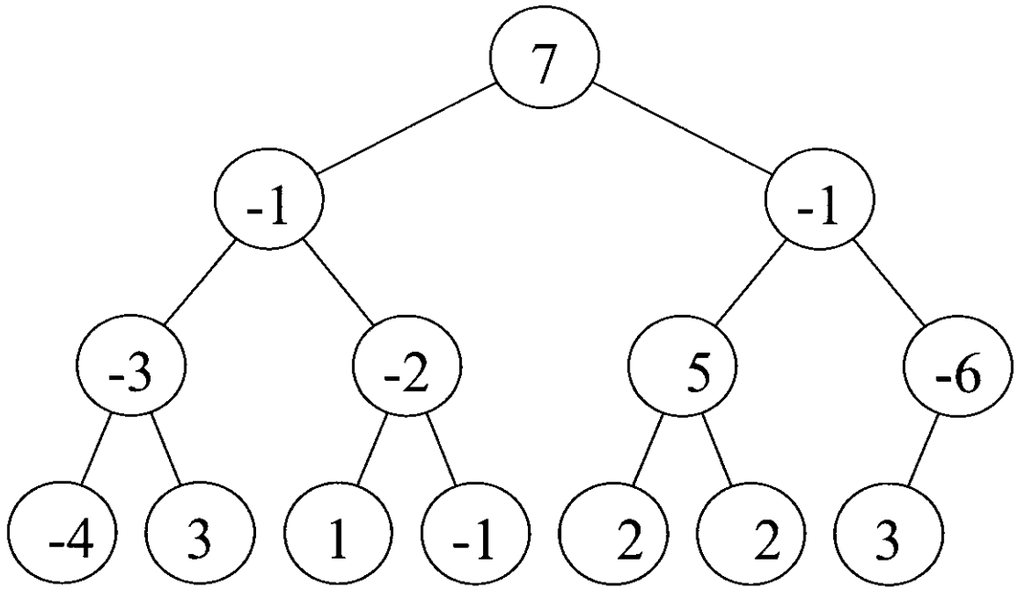
b) second iteration: processor i uses final state of processor i-1 as initial state

1 2 1 3 4 3 6 7 2 1 2 6 9 3 3 6 4 2 3 1 7 2 7 4

Question 11 (10 marks; 10 minutes)

From the message counters in the following topologies of logical processes, use the Flush Barrier to demonstrate if there are transient messages and how many.

a) Tree (5 marks)



There are _____ transient messages.

b) Butterfly (5 marks)

There are _____ transient messages.

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----End of Examination----

Pichaya Tandayya

Lecturer

Question 12 (10 marks; 10 minutes)

Given a scenario that there are 6 logical processes, demonstrate an example of deadlock detection by Diffusing Computations (Dijkstra/Scholten).

----End of Examination----

Pichaya Tandayya

Lecturer

Name_____ ID_____