

**PRINCE OF SONGKLA UNIVERSITY**  
**FACULTY OF ENGINEERING**

**Final Examination:** Semester 2

**Academic Year:** 2007

**Date:** 7 October 2007

**Time:** 9.00-12.00 (3 hours)

**Subject Number:** 240-631

**Room:** A401

**Subject Title:** Parallel and Distributed Simulation Systems

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**Exam Duration:** 3 hours

**This paper has 13 pages, 11 questions and 120 marks (30%).**

**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 English.
- 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		6	10	10	
2	10	10		7	10	10	
3	10	12		8	10	10	
4	10	10		9	10	10	
5	10	8		10	10	10	

**ทูลริตในการสอบ**

โทษขั้ันต่ำ      ปรึบตทในรายวิชานั้ันแลลลพัทการเรีลน 1 ภาคการศึทษา

โทษสูงสุค

ให้ออก

Name \_\_\_\_\_

ID \_\_\_\_\_

**Question 1**

(30 marks; 60 minutes)

- a) What types of applications that use *time parallel* and *space parallel* frameworks? (2 marks)

Time parallel	Space parallel

- b) Compare *Global Virtual Time (GVT)* and *lower bound on the time stamp (LBTS)* (2 marks)

GVT	LBTS

- c) Compare the methods of *Batch fossil collection* and *On-the-fly fossil collection* (2 marks)

Batch fossil collection	On-the-fly fossil collection

- d) Compare the following storage reclaims in terms of algorithms and usage. (4 marks)

Storage optimal protocols	Artificial Rollback

e) What are the pros and cons of *conservative* and *optimistic* algorithms in distributed simulation systems? (6 marks)

Conservative algorithms	Optimistic algorithms
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•	•
•	•
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f) In time warp algorithm, why is GVT needed in case of the fossil collection and I/O operation? (2 mark)

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g) What is a distance matrix and what is it for? (4 marks)

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h) What are anti-messages for and how are they made? (4 marks)

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i) What is message sendback for and what does it cause? (4 marks)

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**Question 2**

(10 marks; 10 minutes)

What are the motivations, solutions and benefits of the following algorithms?

- Event Retraction

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**Question 3**

(12 marks; 10 minutes)

What are the advantages and disadvantages of the following algorithms?

- Copy State Saving

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- Infrequent State Saving

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- Incremental State Saving

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- Reverse Computation

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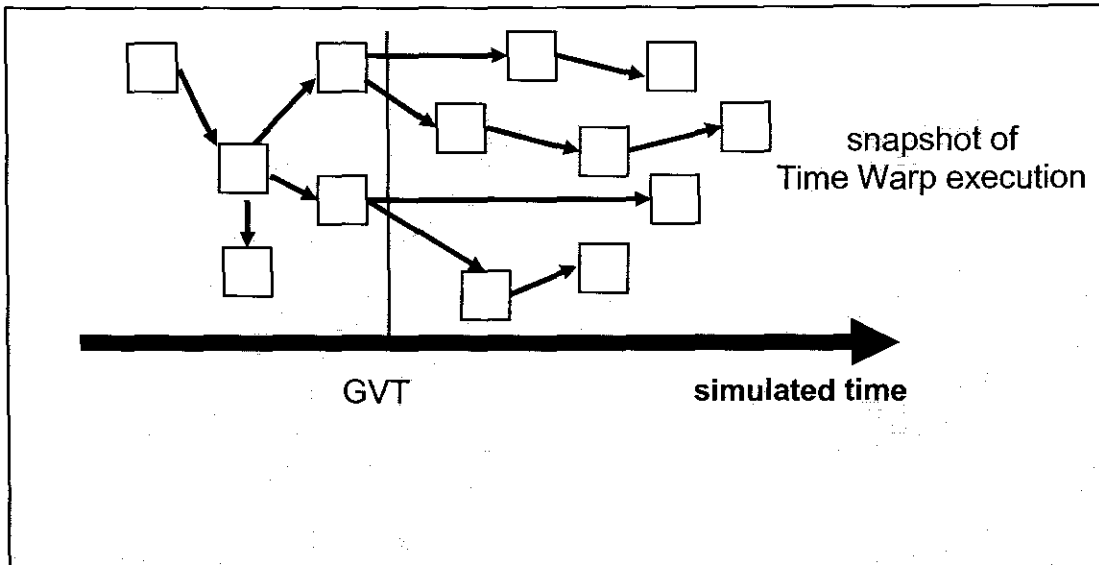
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**Question 5**

(8 marks; 10 minutes)

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



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**Question 6**

(10 marks; 10 minutes)

a) What are transient messages?

(1 marks)

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b) What impacts can they cause?

(1 marks)

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**Question 7**

(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)

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

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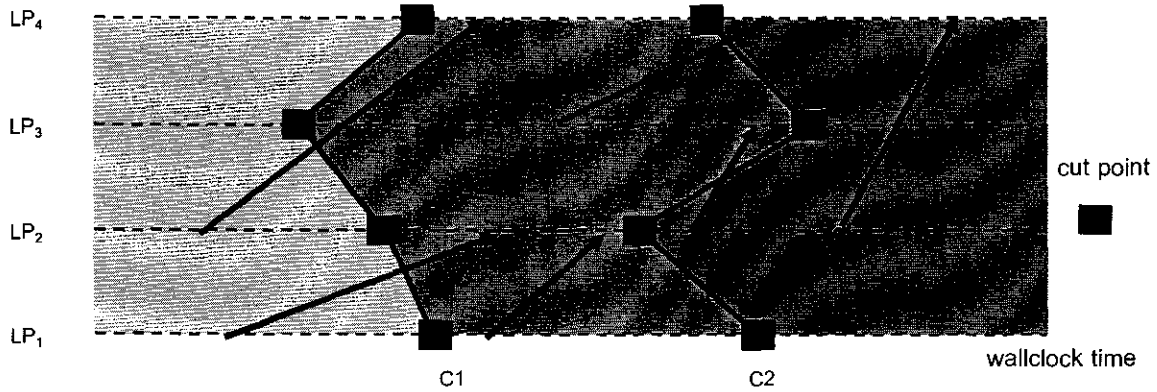
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c) From the below picture, circle cut messages. (2 marks)



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

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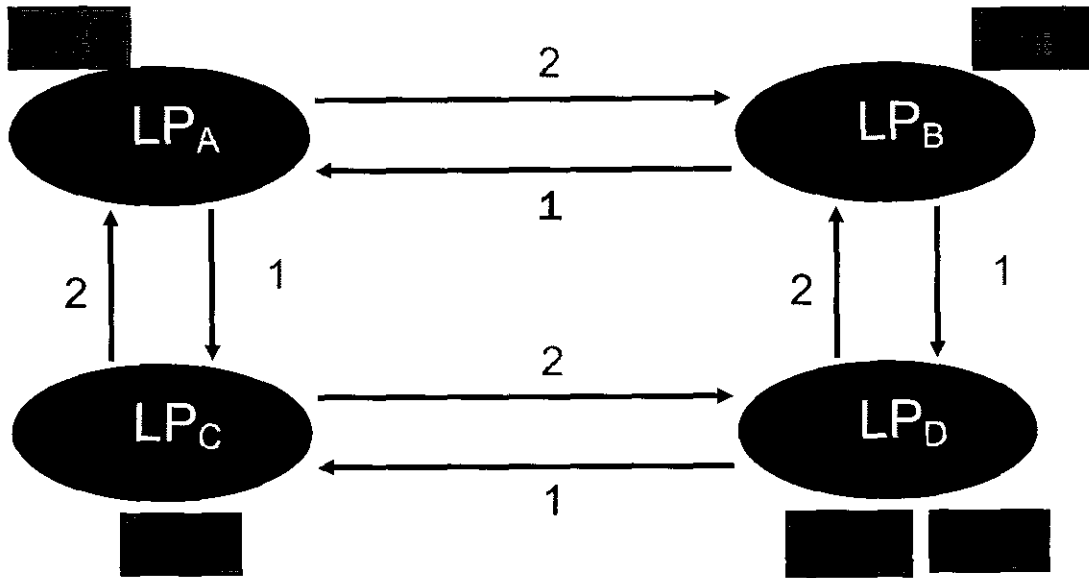
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**Question 8**

(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 when the current simulation time is 2. (4 marks)

A	
B	
C	
D	

c) Which messages depend on which?

(2 marks)

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**Question 9** (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 3 5 4 9 6 7 5 1 7 6 8 4 3 6 6 8 3 1 9 2 7 4**

a) first iteration: assume stack is initially empty

**1 2 3 5 4 9 6 7 5 1 7 6 8 4 3 6 6 8 3 1 9 2 7 4**

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

**1 2 3 5 4 9 6 7 5 1 7 6 8 4 3 6 6 8 3 1 9 2 7 4**

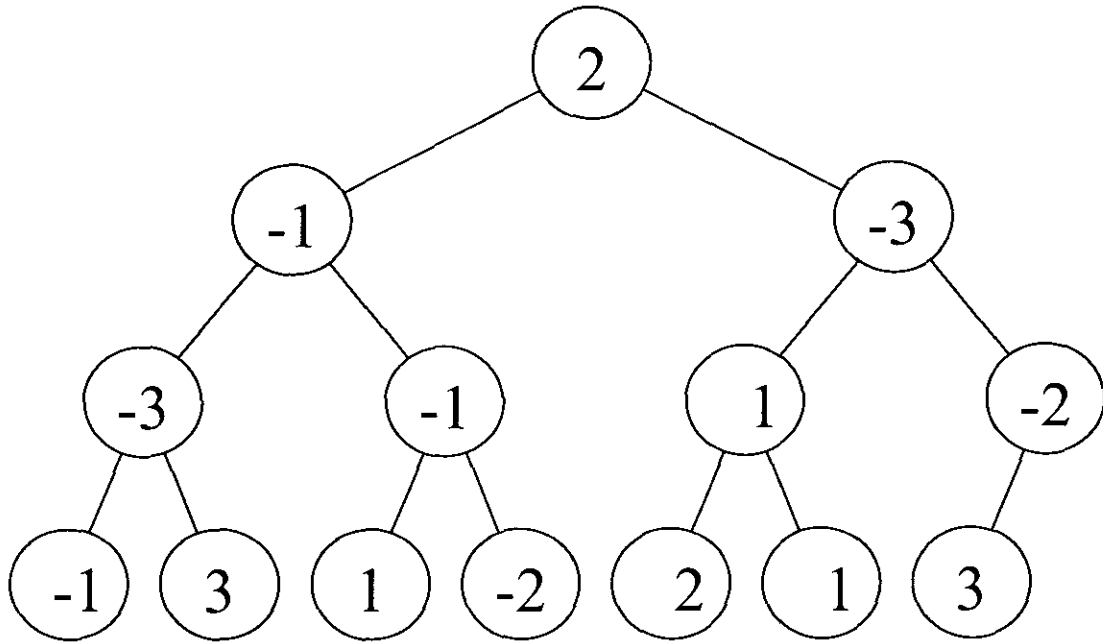
**Question 10**

(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.

---End of Examination---

Pichaya Tandayya/Lecturer