2013

DISTRIBUTED OPERATING SYSTEM

Time Allotted : 3 Hours *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.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

   i) Autonomy refers to the distribution of

      a) data b) control

      c) function d) none of these.

   ii) The condition which must be followed while defining horizontal fragmentation is

      a) completeness b) reconstruction

      c) disjointness d) all of these.

iii) Join graph is used in

a) primary horizontal fragmentation

b) vertical fragmentation

c) derived fragmentation

d) all of these.

iv) The query optimizer acts to

a) access path selector

b) manage local database remains constant

c) interpret user command

d) all of these.

v) In collaborating server architecture

a) there are several database servers

b) each server is capable of running transactions against local data

c) transactions are executed in spanning multiple servers

d) all of these.

vi) Which of the following is the function of distributed Operating System ?

a) Distributed data recovery

b) Distributed query processing

c) Replicated data management

d) All of these.

vii) Granularity means

a) size of memory b) size of data

c) locks d) transaction.

viii) Distributed Operating System is basically placement of

a) data and function b) data and program

c) program and control d) data and control.

ix) During growing phase of two-phase locking locks are

a) released b) acquired

c) both (a) and (b) d) none of these.

x) In a distributed operating system, the deadlock preventions method by aborting the transaction can be used such as

a) time stamping b) wait die method

c) both (a) & (b) d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. What is replication ? Describe Quorum algorithm. 3 + 2

3. What do you mean by happened before relation ? What are the conditions and implementation rules to satisfy for such relation ? 2 + 3

4. Consider the edge-chasing algorithm (without priorities). Give example to show that it could detect phantom deadlock. 3 + 2

5. Assume that strict two-phase locking is in use. Describe how the actions of the two phase commit protocol relate to the concurrency control action of each individual server. How does distributed deadlock detection fit in ?

What is the difference between stateful and stateless servers in VFS ? Explain locational transparency and name resolution in DFS. 2 + 3

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

a) Consider the following precedence constraints that must be satisfied for the execution of processes P1, P2, P3, P4 and P5 :

- P1 can start any time
- P2 can start after P1 completes
- P3 can start after P1 completes
- P4 can start after both P2 and P3 complete
- P5 can start after P3 completes.

Draw a precedence diagram that captures the above constraints, where a node represents a process and a directed edge from process *A* to process *B* means that process *B* should not start until process *A* is completed. 5

b) Briefly describe the Chandy-Mishra-Haas probe based distributed deadlock detection algorithm with a suitable example. 7

c) With an example differentiate between path pushing and edge chasing algorithms. 3

8. a) What are partial ordering and total ordering in the distributed system ? 3

b) What is global state in a distributed system ? Write Chandy-Lamports' global state recording algorithm. 1 + 4

c) Label processes, each event, and using Lamport's logical clock scheme, assign timestamp values (in parentheses below the event identifier) to each event in the space-time diagram below. Follow the conventions used in the text.

i) Does e_{12} happen before e_{22} ?

ii) Are e_{15} and e_{24} concurrent ?

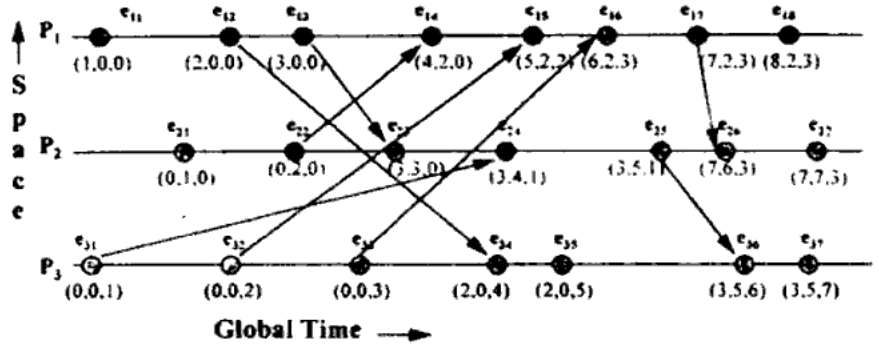
iii) Does e_{23} happen before e_{14} ?

iv) Are e_{35} and e_{17} concurrent ?

v) Does e_{36} happen before e_{27} ?

vi) Are e_{32} and e_{25} concurrent ?

vii) Identify any violation of causal ordering of messages. 7



a) **Explain** the four different algorithms for implementing DSM. 4 × 3

b) **Explain** different forms of memory coherence w.r.t. DSM. 3

A centralised global deadlock detector holds the unique of **local** wait-for graph. Give an example, as to how a phantom **deadlock** could be detected if a waiting transaction in a **deadlock** cycle aborts during the detection procedure.

Write short notes on any *three* of the following : 3 × 5

a) RPC

b) Digital Signature

c) Suzuki-Kasami's broadcast algorithm

d) CODA

e) CORBA

f) ODBC connectivity.

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