Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech(CSE)/SEM-2/MCS-203/2011

2011

DISTRIBUTED COMPUTER SYSTEMS

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) In a distributed system Processors and Memory modules can be interconnected by

      a) CPU – Memory internal bus

      b) Switches

      c) LAN

      d) all of these.

   ii) In a Multiporcessor environment & bus based architectures, the speed of communication among CPUs is maximum for

      a) NUMA b) NORMA

      c) UMAd) same for all.

iii) A UMA architecture can be categorized as

a) MIMD b) MISD

c) SIMD d) SISD.

iv) The No. of messages in the network is maximum for

a) lazy release consistency

b) sequential consistency

c) entry consistency

d) same for all.

v) A high level synchronization mechanism is provided by

a) sitrict consistency

b) sequential consistency

c) barrier

d) all of these.

vi) Chandy-Misra-Haas algorithm is used in a distributed environment for

a) ensuring critical section access

b) selecting distributed co-ordinator

c) detecting distributed deadlock

d) transaction processing.

vii) Lamport's algorithm implements, 'happened before relationship' for message send and receive ordering according to

a) global clock (UTC)

b) real time clock

c) logical clock

d) none of these.

viii) In a distributed environment, the most difficult consistency model to implement is

a) causal consistency

b) strict consistency

c) sequential consistency

d) release consistency.

ix) A two-phase commit protocol refers to

a) detection of termination of a distributed algorithm

b) critical section access

c) clock synchronization

d) transaction processing.

x) For running a parallel algorithm transparently on a NORMA system it is essential to have a

a) DSM

b) virtual memory system

c) paging system

d) all of these.

GROUP – B

(Long Answer Type Questions)

Answer any *five* of the following. 5 × 12 = 60

2. a) Explain the concept of scalability in a distributed system. What are the basic principles to make a distributed system scalable ? 6

b) How do you propose to implement location transparency to a file in a distributed system ? 6

3. a) Explain how distributed shared memory using page as a basic unit can be implemented in a NORMA environment. 5

b) In a NUMA environment if a given read-only page is used frequently by two different processors, what decision the memory management will take regarding the placement of the page ? 5

c) "An invalidation protocol in a paging system works more efficiently compared to an updation protocol". Justify. 2

4. a) What is the utility of the Logical clock in a distributed system ? What are the assumptions necessary for the synchronization of Logical clocks ? 2 + 4

   b) Explain how RPC uses the "Copy – Restore" mechanism to Marshall parameters where the word size for the *rpc* server and *rpc* client are different. 3

   c) Explain with example how a transaction processing is implemented efficiently using private workspace. 3

5. a) Describe two methods by which load measurement of a CPU can be carried out. Describe advantages and disadvantages of each method. 4

   b) Describe an efficient load balancing mechanism which utilizes process migration from one CPU to another. Why do you consider it efficient ? 5

   c) From what viewpoint do you think that a sub-optimal load balancing algorithm performs better than an optimum algorithm ? 3

6. a) What is the difference between true global state and meaningful global state ? 4

   b) In absence of global time how is meaningful global state obtained from a collection of local states recorded at different real times ? 4

   c) State the principles involved. 4

7. a) Describe Ricart – Agarwala's algorithm and its purpose. 5

   b) In case of failure of a node, in the above algorithm how can the system recover ? 3

   c) Describe an algorithm which is used to synchronize a local clock with UTC. Describe the limitations inherent in the algorithm. 4

8. a) Describe the architecture of Network File System.
   How can a user access a file which is located at a distant server ? 7

   b) Describe the centralized algorithm for detecting distributed deadlock, its drawbacks and remedies. 5

9. a) Describe the principles behind the design of fault tolerant systems. 5

b) Describe a fault tolerant paradigm where a faulty system generates wrong information but still continues to function. 7