Ex/CSE/T/423C/2019

COMPUTER SCIENCE & ENGINEERING 4th YEAR EXAMINATION, 2019
Second Semester

DISTRIBUTED COMPUTING

Time: 3 hours Full Marks: 100

Group A (Total Marks: 20) [CO1]
Answer Question No. 1 (Compulsory) and Question No. 2 OR Question No. 3

1. What is a Single-point-of-failure and how can distribution help here? What type of distribution is used to distribute a single database? How load balancing problem can be tackled using different type of distributions. 2+4+4

2. What are the benefits of distributed systems? Discuss some disadvantages or problems of distributed systems that local only systems do not show (or at least not so strong). What are the different forms of transparency in distributed environment? Explain them. 2+3+5

3. Discuss three-tiered client server architecture with proper communication diagram. Describe precisely what is meant by a scalable system. How distributed system is better than centralized system. 5+2+3

Group B (Total Marks: 30) [CO2]
Answer Question No. 4 OR Question No. 5 and Question No. 6 (Compulsory)

4. List the characteristics of a computational Grid. Briefly specify the functionality of the software modules GRAM, GSI, MDS, GridFTP and GASS implemented in Globus toolkit middleware library. Try to illustrate an example application in using each of the five functional modules. 3+7

5. What are the main characteristics of cloud computing? Differentiate between private and public cloud. How does cloud computing provide on-demand functionality (explain with suitable diagram)? 3+3+4

6. a) What is the need of virtualization? Discuss the architecture of hypervisor and discuss its use in Cloud Computing.
   b) Explain the architecture and working principle of Map Reduce with a suitable example. (2+8)+10

Group C (Total Marks: 20) [CO3]
Answer Question No. 7 (Compulsory) and Question No. 8 OR Question No. 9

7. A client wants to send a linked list to a server over the network so that the server can access the elements of the list locally. How you would write the code for sending data and receiving data. Remote objects built with Java RMI are usually registered in a so called "registry". Why? Explain the concept of an object reference in a distributed system. 5+5

8. "Jini provides mechanisms to enable adding, removal, and locating of devices and services on the network" -Explain with the help of different Jini components. 10

[Turn over

9. Define mobile agents and explain how to exploit their advantage. Discuss a Jini based architecture to support mobile agents. 3+7

Group D (Total Marks: 30) [CO4]
Answer Question No. 10 (Compulsory) and Question No. 11 OR Question No. 12

10. a) You are synchronizing your clock from a time server using Cristian's algorithm and observe the following times:
    - timestamp at client when the message leaves the client: 6:22:15.100
    - timestamp generated by the server: 6:21:10.700
    - timestamp at client when the message is received at client: 6:22:15.250

    To what value do you set the client's clock? If the best-case *round-trip* message transit time is 124 msec (0.124 sec), what is the error of the clock on the client?

    b) A system of four processes, (P_1, P_2, P_3, P_4), performs the following events:

    a. P_1 sends a message to P_3 (to event e).
    b. P_1 receives a message from P_3 (from event g).
    c. P_2 executes a local event.
    d. P_2 receives a message from P_3 (from event f).
    e. P_3 receives a message from P_1 (from event a).
    f. P_3 sends a message to P_2 (to event d).
    g. P_3 sends a message to P_1 (to event b).
    h. P_4 executes a local event.

    When taking place on the same processor, the events occur in the order listed. Assign Lamport timestamps to each event. Assume that the clock on each processor is initialized to 0 and incremented before each event. For example, event *a* will be assigned a timestamp of 1.

a. **1**	b.	c.	d.
e.	f.	g.	h.

    c) Assign vector timestamps to each event (above). Assume that the vector clock on each processor is initialized to (0,0,0,0) with the elements corresponding to (P_1, P_2, P_3, P_4). For example, event *a* will be assigned a timestamp of (1, 0, 0, 0). Which events are concurrent with event *d*?

    5+10+5

11. Explain the concept of "Release consistency model". What modification over "Release consistency model leads to "Lazy release consistency model"? Explain with proper example and diagram. 5+5

12. Discuss three properties of weak consistency model. Explain weak consistency with a valid and invalid sequence of events. 10