B.Sc. Engg. CSE 8th Semester (45) 179 06 August 2015 (Afternoon)

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION — SUMMER SEMESTER, 2014-2015

DURATION: 1 Hour 30 Minutes — FULL MARKS: 75

CSE 4803: Parallel & Distributed Processing

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

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1. a) Suppose you are tasked to create a distributed system for a multinational bank which would like to provide ATM service to end users all over the world. To withdraw money from the bank using ATM machines, account holders (end users) have to insert the first name and email along with the security PIN into the machine. They will also have to insert the amount of money they want to withdraw from the ATM. Under these circumstances, your task is to analyze the following scenarios using proper examples and diagrams: 5x4

   i. Design the system in such a way that the authentication server and account information server are different. How can you put a middleware so that each transaction is processed by single request/reply message from/to the clients' end?

   ii. As there would be considerable geographic distance between client and server, what should be your approach to minimize the communication latency? Also discuss how you can design the communication such a way that do not freeze the UI of client's machine.

   iii. There are various goals that can be achieved to develop a distributed system. Describe the requirements for the system so that it can achieve **Migration, Relocation** and **Replication Transparency** where database files are resources.

   iv. After each transaction, the user receives a transaction report which includes the transaction time. What can be the problem if the transaction time is taken from the **client machine** or the **server machine**? If all the ATMs would have to report the amount of money left inside their vaults at a particular time of the day to a main server, what would be the problem(s), assuming that the bandwidth between ATM machines and the servers is infinite. Explain why.

   v. Discuss the **ACID** properties of your system, and with the help of proper examples, describe how the system is conserving those properties.

   b) What is **Clock Drift**? Suppose you created a new JavaScript library (e.g., jQuery) that is reusable for different web based applications. Now, the application developers use your library to develop their web based applications. Whenever the end users access the applications, they need to have the access the javaScript library too. Design a distributed system for the users of your library so that the end users can easily access it efficiently, considering the number of users are very high and they are scattered throughout the globe. 1+4

2. a) Design a distributed content delivery network where users can share and search files. The machines should be connected in such a way that they can be used as a sender and a receiver simultaneously. Optimize the network to take the benefit from machines with higher machine cycles and/or bandwidth. Also try to optimize the network in such a way that the file sharing interests (Audio files, Movies, documents, applications, etc.) of users dictates their search domain in the network. Use proper diagrams to illustrate your network. 2+3+3

b) Suppose you are tasked to design a Medical Information System where each patient's data are monitored by a Distributed Pervasive Network called Body-Area-Network. Data from each patient are stored in a centralized database for the doctors to motitor. The doctors can search by patirnt's ID to find out the current status. Now design the system in a three level architecture and find out the benefits of such architecture in terms of performance, scalibility and maintanance. 8

c) Describe the working principle of BitTorrent file sharing system. 9

3. a) Discuss different types of communications. 5

b) What is RPC? How can one machine call a remote procedure using Server and Client stubs? Also discuss, how the parameters are passed in RPC. Use proper example for explanation. 6+5

c) Suppose you are creating an application that may require a query expanding several databases. Now design the system implementing Berkley Sockets and Message-queuing model with routers. Discuss each implementation's benefits and drawbacks. 5+4

4. a) Discuss the difference between Names, Addresses and Identifiers. 3

b) What are Process Virtual Machines and Virtual Machine Monitors? How can you achieve virtualization in distributed systems using Process Virtual Machines and Virtual Machine Monitors? 4+2

c) What is Virtual Organization? Describe the tasks assigned to different parts of Grid Computing System. 2+4

d) How is Chord System used to create a structured peer-to-peer network? Explain with example. 10.