SOUTH EASTERN KENYA UNIVERSITY

UNIVERSITY EXAMINATIONS 2016/2017

SECOND SEMESTER EXAMINATION FOR THE BACHELOR OF SCIENCE IN COMPUTER SCIENCE & BACHELOR OF INFORMATION TECHNOLOGY

SCI 312: DISTRIBUTED SYSTEMS

DATE: 12TH APRIL, 2017 **TIME: 1.30 -3.30 PM**

INSTRUCTIONS TO CANDIDATES

- **Section A(Compulsory)**
- **Answer ANY TWO questions from section B**

Question One

a. Definethe term distributed system. **(1 Mark)**
b. Justify the need to design a system as a distributed system. **(3Marks)**
c. Differentiate between a local call and a remote call. (**2 Marks)**
d. With aid of a diagram describe what Middleware is. **(2Marks)**
e. Distinguish between call by reference and call by value. **(2 Marks)**
f. Describe the client server model. **(2Marks)**

g. i. Define the term atomic multi-cast as used group communication. **(1 Mark)**
ii. Justify the need for atomic multi-cast when dealing with replicated data. **(2 Marks)**
h. Explain distributed 2-phase commit. **(3 Marks)**
i. Using an illustration explain the Bully algorithm for electing a leader. **(4 Marks)**
j. What is a leap second. **(2 Marks)**
k. Highlight four applications of group communication. **(4 Marks)**
l. Explain Cristian's algorithm for Clock synchronization. **(2 Marks)**

SECTION B (40 marks)- Answer any Two Questions

Question Two

a. i. Suppose there are three processes *A*,*B*and *C*. All clock runs atthe same rate but initially *A*'s clock reads 10, *B*'s clock reads 0and *C*'s clock reads 5. At time 10 by *A*'s clock, *A* sends a messageto *B*, this message takes 4 units of time to reach *B*. *B* then waitsone unit of time and then sends a message onto *C* which takes 2units of time to reach *C*. Assuming that the system implementsLamport's timestamps draw a picture illustrating the timestampsfor the messages and explain how the timestamps are obtained. **(6 Marks)**

ii. What does it mean for two events to be concurrent and what isthe relation of the Lamport timestamps of the two events. **(2 Marks).**

b. With an aid of a diagram, describe remote procedure call between a client and a server. **(6 Marks)**

c. Explain the following file access models:

i. Remote service; **(2 Marks)**

ii. Upload download. **(2 Marks)**

d. It is said that it is easier to recover a stateless server as opposed to a stateful server. Justify this claim. **(2 Marks)**

Question Three

a. Explain the three components of a distributed file system. **(6 Marks)**

b. With an aid of a diagram, explain distributed mutual exclusion. **(4 Marks)**

c. Consider a distributed system comprising of eight processes namely p1, p2, p3, p4,p5,p6,p7,p8**.**Process p2 and process p5 concurrently discovers that process p8 is down and call for election based on a ring algorithm. Using diagrams illustrate the process of getting a new leader. **(6 Marks)**

d. i. Justify the use of replicated servers for fault tolerance in a distributed system. **(2 Mark)**

ii. Distinguish between tightly coupled system and loosely coupled system. **(2 Marks)**

Question Four

a. i. Define the term transparency as used in distributed systems. **(2 Marks)**

ii**.** Explain five types of transparencies. **(5 Marks)**

b. Using an example illustrate berkely algorithm of clock synchronization. **(5 Marks)**

c. Distinguish between the following terms:

i. Idempotent operation and non idempotent operation; **(2 Marks)**

ii. Blocking and non- blocking synchronization semantics; **(2 Marks)**

d.Explain the ACID properties of transactions. **(4Marks)**