JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF INFORMATICS AND INNOVATIVE SYSTEMS

UNIVERSITY EXAMINATION FOR THE DEGREE OF BSC IN COMPUTER SECURITY AND FORENSIC

3RD YEAR 1ST SEMESTER 2018/ 2019 ACADEMIC YEAR

MAIN CAMPUS

COURSE CODE: IIT 3312

COURSE TITLE: DISTRIBUTED SYSTEMS

EXAM VENUE:

DATE: **STREAM: BSC FORENSICS**

TIME: 2 HOURS **EXAM SESSION:**

INSTRUCTIONS:

1. **Answer question 1 (Compulsory) and any other two questions**
2. **Candidates are advised not to write on the question paper**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room**

QUESTION ONE (30 MARKS)

a) You have been invited by a company called Flower Technologies which operates in three countries in East Africa as a consultant to advise on the most appropriate ICT infrastructure they should implement- whether centralized or distributed. The system must be robust, secure and cost-effective.
   i. Explain the meaning of distributed systems, and give two examples (3 marks)
   ii. Discuss at least two main advantages and two disadvantages of distributed systems (4 marks)
   iii. Explain the meaning of centralized systems, and give two examples (3 marks)
   iv. Discuss at least two main advantages and two disadvantages of centralized systems. (4 marks)
   v. In the light of the above advantages and disadvantage, recommend to them the kind of system they should implement. (3 marks)

b) Middleware is a very important component in the design and implementation of any distributed system.
   i. Explain the meaning of middleware in the context of distributed systems. (2 marks)
   ii. With the aid of a suitable diagram, describe the position and functioning middleware in distributed systems. (5 marks)

c) One of the main determining factors of success or failure of distributed systems is coordination of activities and synchronization of processes. With respect to this statement explain the meaning of the following terminologies and state their roles in the aforementioned activities. (6 marks)
   i. Logical clock
   ii. Mutual exclusion
   iii. Deadlocks

QUESTION TWO (20 MARKS)

a) Distributed systems have distinctive features which are unique to them and it is those features that make the distributed systems. State and explain five such features apart from transparency and fault tolerance. (10 marks)

b) Distributed systems require robust algorithms to help in synchronization of processes. Discuss any four synchronization algorithms used in distributed systems. (8 marks)
c) Explain why there is no global clock in distributed systems. (2 marks)

QUESTION THREE (20 MARKS)

a) There are a number of metrics that can be used to measure the performance of distribute systems. Explain any five of these metrics. (5 marks)
b) In the design and implementation of distributed systems, the user requirements play a cardinal role because this will determine success or failure of the system. Outline any six user requirements that need to be catered for by the distributed system. (6 marks)
c) Explain the meaning of homogeneity in distributed systems and how it can be achieved from heterogeneous systems. (4 marks)
d) You have been tasked with the responsibility to create a simple distributed system for an organization. However you must first prepare a model of the system in a virtual environment. Outline the tools you would need for this task and how you would perform the task. (5 marks)

QUESTION FOUR (20 MARKS)

a) Fault tolerance is a very important requirement in all information systems, but particularly so in distributed systems.
   i. Explain the meaning of fault tolerance (2 marks)
   ii. Explain at least three types of faults that can be experienced in distributed systems (6 marks)
   iii. Discuss how a fault tolerant distributed system can be implemented (4 marks)
b) Distributed systems face many security challenges during its operation, especially if not properly designed and implemented.
   i. Explain the meaning of security in information systems (2 marks)
   ii. State three specific logical security challenges faced by distributed systems and how each of them can be mitigated. (6 marks)

QUESTION FIVE (20 MARKS)

a) Transparency is a key feature in distributed computing and therefore any well designed distributed system must exhibit transparency.
   i. Explain the meaning of transparency in this context. (1 marks)
   ii. Discuss any five types of transparency implemented in distributed systems (10 marks)

b) There are a numbers of ways distributed systems can be implemented. These ways yield various types of distributed systems. Briefly, discuss the following types of distributes systems.
   i. Clusters (3 marks)
   ii. Grids (3 marks)
   iii. Sensor networks (3 marks)