



**NAMIPIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**FACULTY OF COMPUTING AND INFORMATICS**

DEPARTMENT OF COMPUTER SCIENCE

<b>QUALIFICATION:</b> BACHELOR OF COMPUTER SCIENCE (COMMUNICATION NETWORKS)	
<b>QUALIFICATION CODE:</b> 08 BCHC	<b>LEVEL:</b> 6
<b>COURSE:</b> DISTRIBUTED SYSTEMS	<b>COURSE CODE:</b> DTS620S
<b>DATE:</b> JANUARY 2019	<b>SESSION:</b> THEORY
<b>DURATION:</b> 2 HOURS	<b>MARKS:</b> 80

<b>SECOND OPPORTUNITY/SUPPLEMENTARY EXAMINATION QUESTION PAPER</b>	
<b>EXAMINER:</b>	MR. ATLEE M. GAMUNDANI
<b>MODERATOR:</b>	PROF JOSE QUENUM

**THIS QUESTION PAPER CONSISTS OF 1 PAGE**  
(Excluding this front page)

**INSTRUCTIONS**

1. Answer ALL the questions.
2. Write clearly and neatly.
3. Begin each question on a new page.
4. Number the answers clearly as per the question paper numbering.
5. Marks/Scores per question paper are given in [].
6. NUST examination rules and regulations apply.

**PERMISSIBLE MATERIALS**

1. Scientific Calculator

### Question 1

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- (a) Define distributed computer systems using everyday examples of distributed systems. [4 marks]
- (b) Why is clock synchronisation needed in distributed systems? [2 marks]
- (c) Illustrate the Lamport's logical clocks algorithm and explain how its key ideas are applied in distributed systems. [8 marks]
- (d) Explain the different reliability and ordering guarantees in distributed communication. [6 marks]

### Question 2

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- (a) Evaluate the key design choices in distributed file systems relating to caching, consistency and naming. [6 marks]
- (b) Compare the various techniques that can support scalability. [8 marks]
- (c) What is the relationship between total ordered multicast and distributed consensus? [4 marks]
- (d) Why group communication in distributed systems? [2 marks]

### Question 3

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- (a) How would you use the five key security mechanisms used to implement security policies in distributed systems. [10 marks]
- (b) Which approach would you use to apply the basic steps of fault-tolerance in an airline reservation system? [6 marks]
- (c) What are the pros of active as compared to passive replication style? [4 marks]

### Question 4

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- (a) What would you classify as the potential role of more advanced scalability techniques such as the use of alternative communications infrastructure, P2P techniques and also the use of agents? [6 marks]
- (b) How would you summarise the key concepts underpinning technologies, such as containment? [4 marks]
- (c) What ideas or facts show the challenges imposed by areas such as multimedia, mobility and multiplicity and the implications that this has for distributed systems design? [6 marks]
- (d) Can you defend the rationale for the emergence of component-based middleware? [4 marks]

\*\*\*\*\*END OF EXAMINATION PAPER\*\*\*\*\*