

UNIVERSITY EXAMINATIONS

1ST SEMESTER 2022/2023 ACADEMIC YEAR

FOURTH YEAR EXAMINATION FOR THE
DEGREE BACHELOR OF SCIENCE (COMPUTER
SCIENCE)

COMP 411: DISTRIBUTED SYSTEMS

STREAM: R

TIME: 2 HRS

DAY: TUESDAY [11.30AM – 13.30] DATE: 20/12/2022

THIS QUESTION PAPER CONSISTS OF FOUR (4) PAGES

PLEASE DO NOT OPEN UNTIL THE INVIGILATOR SAYS SO.

INSTRUCTIONS: - ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS FROM SECTION B.

SECTION A

QUESTION ONE

- (a) Outline four sharable resources in a distributed system. [2 marks]
- (b) With appropriate examples, differentiate between implicit and explicit addressing. [4 marks]
- (c) Differentiate between transparency and openness as design issues in distributed systems. [2 marks]
- (d) Outline five kinds of security threats to consider when designing and implementing a distributed system. [5 marks]
- (e) Explain the meaning of the term ‘Remote Method Invocation’ and how it works in a distributed system. [3 marks]
- (f) State and explain any two concurrency problems that may occur in distributed systems. [4 marks]
- (g) What are Client and Server Stubs and how are they used in remote procedure calls? [4 marks]
- (h) Describe the Byzantine Generals’ problem and its relevance to distributed systems. [6 marks]

SECTION B (Answer any 2 questions)

QUESTION TWO

- (a) Security goals of any computer system are decided by its security policy, state and explain three security goals that can be set in a distributed system. [6 marks]
- (b) With appropriate diagrams differentiate between loosely coupled and tightly coupled systems. [6 marks]
- (c) Explain what problems can happen there is no concurrency control where multiple transactions are being executed at the same time. [4 marks]
- (d) Discuss 4 necessary conditions for a deadlock to occur. [4 marks]

QUESTION THREE

- (a) A distributed system is a collection of autonomous / independent computers linked by a computer network that appear to the users of the system as a single computer.
- (i) State three advantages of distributed systems over a single computer system. [3 marks]
- (ii) Outline three real life examples of distributed systems. [3 marks]
- (iii) Briefly explain three factors to consider when designing a distributed system. [6 marks]
- (b) Distribution transparency is an important goal of any distributed environment. Discuss any four types of transparency feature that a user should consider when designing a DS. [8 marks]

QUESTION FOUR

- (a) There are various design approaches that have been suggested in building dependable distributed systems that exhibit a high level of stability and fault tolerance, explain any three of these approaches. [6 marks]
- (b) A system that fails does not adequately provide services it was designed for. Explain four types of failures that may occur in parallel and distributed systems. [4 marks]
- (c) The token ring algorithm is used in distributed systems to achieve mutual exclusion. Discuss how mutual exclusion is achieved using this algorithm. [6 marks]
- (d) Describe what middleware is with examples. [4 marks]

QUESTION FIVE

- (a) Discuss the advantages of a distributed system versus a centralized system. [6 marks]
- (b) Discuss the steps involved in remote procedure call between clients and servers. [8 marks]
- (c) State and explain three importance of IPC (Inter-process Communication). [6 marks]



