



MACHAKOS UNIVERSITY

University Examinations for 2020/2021

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

FOURTH YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (COMPUTER SCIENCE)

SCO 410: DISTRIBUTED SYSTEMS

DATE: 12/8/2021

TIME: 11:00 – 1:00 PM

INSTRUCTIONS

Answer question ONE and any other Two questions

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Highlight four differences between distributed and centralised systems. (8 marks)
- b) In a distributed system, transparency is vital. Discuss three types of transparency in distributed system. (6 marks)
- c) Using a suitable diagram, illustrate the difference between bus based and switch based shared memory (4 marks)
- d) Discuss the following as related to distributed systems
 - i) Network operating system (2 marks)
 - ii) Distributed operating system. (2 marks)
 - iii) middleware. (2 marks)
- e) State the meaning of the following acronyms in relation to distributed systems.
 - i) RPC (1 mark)
 - ii) RMI (1 mark)
- f) Discuss two systems architectures in distributed systems in application today (4 marks)

QUESTION TWO (20 MARKS)

- a) Differentiate between Synchronous and Asynchronous distributed system (4 marks)
- b) In designing a distributed system, failure handling is very critical aspect, that cannot be ignored. Analyse **four** of the failures you will consider at the design level and how you would address them. (8 marks)
- c) Discuss three approaches to address security threats in a distributed system. (6 marks)
- d) Differentiate between UDP and TCP (2 marks)

QUESTION THREE (20 MARKS)

- a) Differentiate between internal and external Synchronizing physical clocks (2 marks)
- b) Explain the meaning of the following terms:
 - i. Clock resolution (2 marks)
 - ii. Clock scew (2 marks)
 - iii. Clock drift (2 marks)
 - iv. Faulty clock (2 marks)
- c) Discuss the Network Time Protocol (NTP) and three ways in which it is applied in ascertaining uniformity and synchronization of timing in distributed systems located in different continents. (6 marks)
- d) Discuss how the following aspects are implemented in a distributed system.
 - i. Garbage collection (2 marks)
 - ii. Deadlock detection (2 marks)

QUESTION FOUR (20 MARKS)

- a) Discuss the following terms concerning Distributed Mutual Exclusion
 - i. Race condition (2 marks)
 - ii. Critical section (2 marks)
 - iii. Mutual exclusion. (2 marks)
- b) Explain the multicast and logical clocks algorithm as applied in distributed system. (4 marks)
- c) While communicating in a multicast mode, there is a degree of reliability that must be ensured. Discuss three aspects that ensure reliability in multicasting. (6 marks)
- e) Highlight the steps involved in a Consensus Process in a multicast. (4 marks)

QUESTION FIVE (20 MARKS)

- a) Operating systems and middleware co-exist in a distributed system. Discuss five ways in which the operating system supports the middleware. (10 marks)
- b) Name five Typical Middleware Services (5 marks)
- c) Differentiate between Monolithic kernel and microkernel (4 marks)
- d) Explain the role of DNS in a distributed environment. (1 mark)