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(*University of Choice*)

MASINDE MULIRO UNIVERSITY OF

SCIENCE AND TECHNOLOGY

(MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

MAIN EXAM

2022/2023 ACADEMIC YEAR

FOUTH YEAR FIRST SEMESTER **EXAMINATION**

FOR THE DEGREE OF BACHELORS OF SCIENCE IN

(COMPUTER SCIENCE & INFORMATION TECHNOLOGY)

COURSE CODE: BCS 410/ BIT 417

COURSE TITLE: DISTRIBUTED SYSTEMS

DATE: 06/12/2022   **TIME:** 8:00-10:00AM

INSTRUCTIONS TO CANDIDATES:
ANSWER QUESTIONS ONE AND ANY OTHER TWO.

MMUST observes ZERO tolerance to examination cheating

Paper Consists of 8 Printed Pages. Please Turn Over ▶

QUESTION ONE (COMPULSORY)   [30 MARKS]

a. Differentiate between the following concepts

   i.   Synchronous communication and asynchronous communication   **[2 marks]**

  ii.   What is marshalling and unmarshalling   **[2 marks]**

b. What is remote method invocation? What are the commonalities and differences between RPC and RMI?   **[4 marks]**

c. Discuss the Key design issues for distributed file systems?   **[4 marks]**

d. Explain why middleware based distributed systems are built above network operating systems, not distributed operating systems.   **[4 marks]**

e. Describe the differences between network operating systems, distributed operating systems and middleware based distributed systems.   **[6 marks]**

f. Early distributed computing approaches assumed that the middleware has to provide complete distribution transparency. Currently this opinion is challenged. Explain why?

    [4 marks]

g. Why is transparency an important property that a distributed system designer should achieve and also give one good reason why it may be desirable for a system NOT to provide complete transparency?   **[4 marks]**

QUESTION TWO   [20 MARKS]

a. What are types of Communication in Distributed Systems?   **[2 marks]**

b. What are main differences between remote procedure call and remote method invocation?

    [2 marks]

c. In static EMI (compile time RMI) studs are created and linked to the client and server when the client and server are being developed. What happens in the case of dynamic RMI?

    [2 marks]

d. Is the name www.mmust.ac.ke/index.html" location independent? Explain what a "location independent" name is.   **[2 marks]**

e. Describe the role of HTT, SOAP and WSDL in web services and show protocols/ concepts/ servers with similar roles in CORBA.   **[6 marks]**

f. We want to compare the performance of a single –threaded and a multi-threaded file server. The following assumptions are made. It takes 10ms to get a request, dispatch it and do the rest

of the necessary processing involved in servicing the file, assuming the file is cached in main memory. If the file is not cached, a disk operation is needed in which case an additional 50ms is required, during which the thread sleep. We assume that for one third of all requests, the file can be served from the cache.

    i.   How many requests per second can the single-threaded server handle?

                  [3 marks]

    ii.   How many requests per second can the multi-threaded serve handle? Assume that there is always enough threads.   [3 marks]

QUESTION THREE   [20 MARKS]

a. Explain the benefits of logical clocks over physical clocks in distributed systems environment.   [2 marks]

b. Give two examples of application that require persistent and asynchronous communication. Explain your answer.   [2 marks]

c. Discuss pros and cons for centralized and distributed exclusive algorithms.   [4 marks]

d. Many distributed algorithms require the use of a coordinating process. To what extent can such algorithms be considered? Discuss.   [4 marks]

e. Describe the issues involved in a failure recovery with the help of a distributed computation.

                  [4 marks]

h. Provide two examples of client-server application in which using a multi-threaded client is advantageous compared with a single threaded client. Explain.   [4 marks]

QUESTION FOUR   [20 MARKS]

a. Explain the role of names identifiers and addresses.   [4 marks]

b. Explain why DNS in not very suitable for providing naming of mobile entities and also not the best choice for providing location information for mobile objects.   [4 marks]

c. What are the differences between the x.500 naming model and the Internet Domain Name System?   [4 marks]

d. In a hierarchical location services with a depth of n, how many location records need to be updated at most when a mobile entity changes its location.   [2 marks]