TECHNICAL UNIVERSITY OF KENYA

FACULTY OF APPLIED SCIENCES AND TECHNOLOGY

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

END OF SEMESTER EXAMINATION SERIES

FIRST SEMESTER EXAMINATIONS 2018/2019

FOURTH YEAR EXAMINATIONS FOR THE DEGREE OF

BACHELOR OF TECHNOLOGY IN COMPUTER TECHNOLOGY

BACHELOR OF TECHNOLOGY IN INFORMATION TECHNOLOGY

BACHELOR OF TECHNOLOGY IN COMPUTER NETWORK TECHNOLOGY

ECCI 4104/ECSI 4104/ECII 4104: DISTRIBUTED SYSTEMS

TIME: 2 Hours

Instructions to candidates:

This paper consists of FIVE Questions.

Answer Question ONE [30 Marks] and any other TWO Questions [20 Marks Each].

Write your college number on the answer sheet.

This paper consists of 3 printed pages

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

QUESTION ONE: [30 MARKS] COMPULSORY

a) Define a distributed system and give two examples of software that run on a distributed system [2 Marks]

b) Explain the following terms relating them to central themes of distributed systems and give example
    implementations   [4 Marks]

       i.   Inter process communication
       ii.   Remote invocation
       iii. Indirect communication

c) Explain challenges of implementing distributed systems   [2 marks]

d)   In the 1990s, research by chip manufacturers found that they couldn't increase GHz much more without
    CPU temperatures reaching solar levels. How has the concepts of distributed systems enabled realization of
    higher clock speeds in modern day computer chips   [2 Marks]

e) In typical distributed system architecture, one can find Proxy servers and caches. Explain the roles of these
    in such a system   [5 Marks]

f) Describe any three industries that exploit the advantages of distributed systems to achieve their goals. You
    should relate the major features of these industries to exploit advantages of distributed systems [3 Marks]

g) Describe any two motivations of distributed systems architectures   [4 Marks]

h) Compare and contrast the Beowulf and the Mosix cluster models   [4marks]

i) For distributed systems implemented in the following sample systems, describe the pertinent Design issues
    faced   [4 Marks]

       i.   Distributed Database management systems (DBMS)
       ii.   Google file system (GFS)

QUESTION TWO: 20 MARKS

a) Distributed Systems can be analyzed based on the dimensions of: processors, data and Control. Based on
    levels of distribution in these dimensions:

       i.   Describe what is an Autonomous transaction based system [3 Marks]
       ii.   Describe what is a Heterogeneous general purpose system   [3 Marks]
       iii. Explain what would constitute a fully distributed system [4 Marks]
b) Compare and contrast five characteristics of centralized systems on the one hand and distributed systems
    on the other hand   [10 Marks]

QUESTION THREE: 20 MARKS

Diagrammatically and schematically represent the architectures of distribution in the following systems [20 Marks]

     i.   Automatic Teller Machine Network
    ii.   Mobile and Ubiquitous Computing
   iii.   Web servers and Web browsers
   iv.   Internet (including Local Area Networks)

QUESTION FOUR: 20 MARKS

For an example distributed information system as a case study, explain the following characteristics. For each characteristic you should provide a definition, at least two ways of realizing the characteristic and then an explanation of how it is evident in the case study.   [20 Marks]

     i.   Openness
    ii.   Security
   iii.   Scalability
   iv.   Failure Handling

QUESTION FIVE: 20 MARKS

Describe what the following basic design issues of distributed systems entail.   [20 Marks]

     i.   Naming
    ii.   Communication
   iii.   Software structure
   iv.   System architecture
    v.   Workload allocation