



(Knowledge for Development)

KIBABII UNIVERSITY COLLEGE

A CONSTITUENT COLLEGE OF

MASINDE MULIRO UNIVERSITY OF

SCIENCE AND TECHNOLOGY

UNIVERSITY EXAMINATIONS

2014/2015 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER

MAIN EXAMINATION

FOR THE DEGREE OF COMP SCIENCE

COURSE CODE: CSC 473 E

COURSE TITLE: PARALLEL COMPUTER ARCHITECTURE

DATE: 8TH MAY, 2015

TIME 8.00-10.00AM

INSTRUCTIONS TO CANDIDATES

Answer Question One in Section A and Any other **TWO** (2) Questions in Section B

QUESTION 1

- a. Explain any three parallel computer memory architectures? 6mks
- b. Describe the application areas of parallel computing? 8mks

- c. Computers have been evolving in terms of their models of processing data and instructions. The model that changed how computers process instructions and data was the famous Von Neumann architecture. Explain the von Neumann computer architecture and its importance in computing? 4mks
- d. Some of the practical implementation of clusters in the real world has been in web hosting. Describe a scenario that successfully implements cluster computing based on web hosting. 4mks
- e. One of the main concepts that influenced the development of clusters was load balancing. There are many benefits to clustering computers to share loads. Explain four reasons that justify this load balancing. 4mks
- f. We have argued that clusters must be homogeneous. Discuss the problems that arise with the introduction of heterogeneity in a cluster. 4mks

SECTION B

QUESTION 2

- a) Explain three types of synchronization as used in parallel programming. 6mks
- b) With regard to granularity, compare between coarse grained granularity and fine grained granularity. 4mks
- c) Why are I/O operations regarded as parallelism inhibitors? 2mks

Give an example. 2mks.

- d) Google is a search engine that implements clusters and load balancing. Explain how it is able to implement these concepts procedurally. Hint: take an example of searching for information on the internet. 6mks

QUESTION 3

- a) We have discussed both shared memory and distributed memory parallel systems in class. Which of these systems would you expect to be more scalable, and which of these systems would you expect to have lower communication costs? Explain your answers. 6mks
- b) Explain the main benefits of parallel computing. 4mks

- c) With the aid of a diagram, clearly describe how the distributed memory /message passing parallel programming model is implemented. 10mks

QUESTION 4

- a. Define Amdahl's law with regard to parallel computers. 2mks.
- b. Explain the importance of Amdahl's law in parallel computing: 4mks
- c. Describe any three various parallel programming models.6mks
- d. MPI was characterized as SPMD (Single Program Multiple Data) computing. What is SPMD computing and how is it different from the SIMD computing?8mks

QUESTION 5

- a) Specially in a parallel system based on distributed memory, communication or communication patterns, play a major role. Succinctly explain which role is that, what costs it has, and what can be made to minimize its impact. 6mks
- b) With regard to designing parallel programs, explain the term partitioning. 4mks
- c) What are some of the factors to consider when designing your programs inter task communications. 6mks
- d) Infrastructure is a very important element of cluster orientation. Explain the following terms as used in cluster connectivity infrastructure. 4mks
- Latency and
 - Bandwidth

QUESTION 6

- a) Describe the technology drivers that have led to the multi core paradigm shift. 4mks
- b) Why is control flow a performance concern in SIMD architectures? 4mks
- c) Why is data locality so important to the performance of parallel code? 4mks
- d) What are the reasons why a parallel version running on 2 or more processors of a sequential code might run slower than the sequential version? 4mks
- e) With regard to high dependability in clusters, explain the following terms: 4mks
- Cold backup
 - Hot backup

