Kasarani Campus
Off Thika Road
Tel. 2042692 / 3
P. O. Box 49274, 00100
NAIROBI
Westlands Campus
Pamstech House
Woodvale Grove
Tel. 4442212
Fax: 4444175

KIRIRI WOMEN'S UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2023/2024 ACADEMIC YEAR
THIRD YEAR, SECOND SEMESTER EXAMINATION
FOR THE BACHELOR OF SCIENCE IN COMPUTER SCIENCE
KCS 413 – PARALLEL SYSTEMS

Date: 08TH December 2023
Time: 2:30PM – 4:30PM

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

a) Differentiate between the following terms as use in parallel systems
   i) Concurrent and Parallel executions. (2 Marks)
   ii) Opcode and Operand (2 Marks)
   iii) Loosely coupled systems and Tightly coupled systems (2 Marks)
   iv) Critical section and Race condition (2 Marks)
   v) Dynamic Programming and Linear Programming (2 Marks)

b) The wait protocol is used for resolving the conflicts, which arise because of a number of multiprocessors demanding the same resource. Outline the two types of wait protocols (2 Marks)

c) Describe any three popularly used interconnection networks (3 Marks)

d) Identify three methods by which processors can communicate with each other (3 Marks)

e) Expound the four operating system design and management issues raised by the existence of concurrency (4 Marks)

f) Itemize four merits of Shared Memory Programming (4 Marks)

g) Describe the following constraints enforced on PRAM model
   i) Exclusive Read Exclusive Write (EREW)
   ii) Exclusive Read Concurrent Write (ERCW)
   iii) Concurrent Read Exclusive Write (CREW)
   iv) Concurrent Read Concurrent Write (CRCW) (4 Marks)

QUESTION TWO (20 MARKS)

a) Define the following terms as used in concurrency and synchronization
   i) Semaphores
   ii) Monitors
   iii) Locks (6 Marks)

b) Using a diagram, explain the states of a process (8 Marks)

c) Describe the following message passing system during synchronization between processes
   i) Blocking send, blocking receive (2 Marks)
   ii) Non-blocking send, blocking receive (2 Marks)
   iii) Non-blocking send, non-blocking receive (2 Marks)

QUESTION THREE (20 MARKS)

a) Discuss Flynn's classification based on instruction and data streams (8 Marks)

b) A deadlock refers to the situation when concurrent processes are holding resources and preventing each other from completing their execution. Discuss the four conditions that can prevent the deadlock from occurring. (8 Marks)

c) Describe how the following factors determine the performance and issues in pipelining

i) Speedup (2 Marks)

ii) Throughput (2 Marks)

QUESTION FOUR (20 MARKS)

a) Define the following terms related to interconnection networks.

i) Node degrees

ii) Dynamic connection network

iii) Network diameter (6 Marks)

b) Enumerate applications of parallel processing. (4 Marks)

c) Identify and explain the five parameters used to measure the performance of interconnection networks (10 Marks)

QUESTION FIVE (20 MARKS)

a) Differentiate between the following terms used in parallel System

i) Scalar processing and Superscalar processing (2 Marks)

ii) Sequential algorithms and Parallel algorithms. (2 Marks)

iii) Grid computing and Cluster computing (2 Marks)

b) Describe the four major stages of executing the instruction (8 Marks)

c) Discuss the three fundamental parameters required for the analysis of parallel algorithms (6 Marks)