KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2016/2017 ACADEMIC YEAR

SPECIAL/SUPPLEMENTARY EXAMINATIONS
YEAR FOUR SEMESTER TWO EXAMINATIONS

FOR THE DEGREE OF
BACHELOR OF SCIENCE COMPUTER SCIENCE

COURSE CODE : CSC 355E

COURSE TITLE : PARALLEL COMPUTER ARCHITECTURE

DATE: 28/09/2017 **TIME:** 3:00 P.M – 5:00 P.M

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTIONS ONE AND ANY OTHER TWO.

QUESTION ONE-COMPULSORY (30marks)

a) List the four classes of parallel computers according to Flynn's Taxonomy   [4 marks]

b) Briefly describe any three factors influencing parallel computing.   [6marks]

c) Traditional techniques of increasing uniproccessors performance are nearly reaching their

limits. Explain   [6 marks]

d) Briefly describe the following parallel programming models

   i) Shared address space   [2 marks]

   ii) Message passing   [2 marks]

   iii) Data parallel programming   [2 marks]

e) State the importance of caches in high performance microprocessors   [2 marks]

f) Using relevant diagrams, explain the working of any two cache schemes   [6 marks]

QUESTION TWO (20marks)

a) Explain any three desired characteristics of parallel systems   [6 marks]

b) State any two advantages and two disadvantages of the distributed system multicomputers

     [4marks]

c) Discuss the following classes of Shared memory parallel multiprocessors

   i) Uniform Memory Access (UMA) ,   [2 marks]

   ii) Non-Uniform Memory Access (NUMA)   [2 marks]

d) Using relevant diagrams illustrate the following types of multicore architectures

   i) Pipe-line design   [3 marks]

   ii) Hierarchical design   [3 marks]

QUESTION THREE (20mks)

a) What is memory contention in multiprocessors [1mark]

b) Explain how memory contention is resolved in tightly coupled and loosely coupled multiprocessors [4 marks]

c) Write short notes on the Following models for dynamically scheduled processors
- Relaxing the Write-to-Read Program Order . [2 marks]
- Relaxing the Write-to-Read and Write-to-Write Program Orders. [2 marks]
- Relaxing All Program Orders . [2 marks]

d) In an experiment to determine performance of processors, the data in the table below are obtained. Use the values to answer questions 3 (d)(i & ii)

	Intel Pentium 4 2.4GHz Single-core	Intel Pentium 4 2.8GHz Single-core	Intel Pentium G640T 2.4GHz Dual-core
Number of Processes	38	38	38
CPU Usage	57%	40%	16%
Physical Memory	29% - 30% 611MB – 624MB	32% - 33% 620MB – 650MB	40% - 41% 795MB – 816MB
Maximum Frequency	100%	100%	60% - 69%
Time Taken to Copy files	1489 seconds	1446 seconds	1284 seconds
CPU Temperature Before Experiment	38°C	38°C	35°C
CPU Temperature After Experiment	41°C	41°C	39°C
Core Voltage	1.470volts	1.340volts	0.776volts
Maximum TDP	89W	89W	35W

i) Compare the performance of Intel Pentium IV 2.8GHz Single-core and Intel Pentium G640T 2.4GHz Dual-core systems in terms of speed in percentage [3 marks]

ii) Determine speed-up for the set in d(i) above [2 marks]

e) Differentiate between network switching and network routing [4marks]

QUESTION FOUR (20marks)

a) Define the following terms as used in caches

    i) Snoop [1 mark]

    ii) Snarf [1 mark]

    iii) Dirty Data [1 mark]

    iv) Stale Data [1 mark]

b) Using relevant illustrations, describe how the following protocols are used to achieve data consistency in caches.

    i) Snoopy bus protocol [6 marks]

    ii) Directory based protocol [6 marks]

c) Explain why S-COMA is more cost-efficient than normal COMA. [4 marks]

QUESTION FIVE (20marks)

a) State major problems that complicate the task of multiprocessor design. [2 marks]

b) State any two ways of overcoming replication capacity problem [2 marks]

c) Explain the following common interconnection networks in multiprocessors

    i) Shared bus. [3 marks]

    ii) Multiple bus. [3 marks]

    iii) Crossbar switch and Multiport. [3 marks]

d) Discuss the approaches to latency tolerance [6 marks]