# MAASAI MARA UNIVERSITY

## REGULAR UNIVERSITY EXAMINATIONS

## 2017/2018 ACADEMIC YEAR

## EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER   SCIENCES

**COURSE CODE:  COM 310**

**COURSE TITLE:  COMPUTER ARCHITECTURE**

**DATE: 19TH APRIL 2018      TIME:  11.00 A.M. -1.00 P.M.**

**INSTRUCTIONS:**
**SECTION A   IS   COMPULSORY ATTEMPT TWO QUESTIONS   IN SECTION B**

**QUESTION ONE**                                              **( 30 MARKS)**

a) Answer the following objective questions                    ( 10  marks)

   i.     The _____ format is usually used to store data.

          a) BCD

          b) Decimal

          c) Hecadecimal

          d) Octal

   ii.    The 8-bit encoding format used to store data in a computer is _____

          a) ASCII

          b) EBCDIC

          c) ANCI

          d) USCII

   iii.    A source program is usually in _____

          a) Assembly language

          b) Machine level language

          c) High-level language

          d) Natural language

   iv.    Which memory device is generally made of semi-conductors?

          a) RAM

          b) Hard-disk

          c) Floppy disk

          d) Cd disk

   v.     The small extremely fast, RAM's are called as _____

          a) Cache

          b) Heaps

          c) Accumulators

          d) Stacks

   vi.    The ALU makes use of _____ to store the intermediate results.

          a) Accumulators

          b) Registers

          c) Heap

          d) Stack

   vii.   The control unit controls other units by generating ___

          a) Control signals

          b) Timing signals

c) Transfer signals

d) Command Signals

viii.    _____ are numbers and encoded characters, generally used as operands.

a) Input

b) Data

c) Information

d) Stored Values

ix.    _____ bus structure is usually used to connect I/O devices.

a) Single bus

b) Multiple bus

c) Star bus

d) Rambus

x.    _____ is generally used to increase the apparent size of physical memory.

a) Secondary memory

b) Virtual memory

c) Hard-disk

d) Disks

b)  There are two forms of primary memory.                                    (6 marks)

i.    Read Only Memory (ROM)

ii.    Radom Access Memory  (RAM).

Compare the  two.

-  .

c)  The chipset consists of two major microchips; Northbridge and Southbridge. Give the functions of each.                                    (4 marks)

-   .

d)   Explain the difference between a dual core processor and a core 2 quad       ( 3 marks)

d.  Explain in detail the following  CPU technologies                          (3  marks)

i.    -Hyperthreading
ii.    -Microcode
iii.    -Overcloking

**f.** Assume that you have a program that has two execution phases. One phase runs for 8 seconds and the  second phase runs for 2 seconds. You can improve the performance of only one phase by a factor of 4.

(A) What best overall speedup you can get through this improvement? (B) And what is the best overall speedup you can get through improving one phase only?      ( 4 marks)

# SECTION B
## QUESTION TWO ( 20 MARKS)

a. Discuss the following types of Registers                                    ( 4 marks)

   i.    Instruction Register (IR)
   ii.   Program Counter (PC)
  iii.   Memory Address Register (MAR)
  iv.   Memory Data Register (MDR):

b. Execution of an instruction takes place in two phases discuss them     ( 6 marks)
c. Discuss memory read and memory write                                      ( 6 marks)
d. Explain the difference between External word length and Internal word length
(4 marks)

## QUESTION THREE ( 20 marks)

i) A creative designer realizes one day that he can increase the L1 cache size of his design from 64KB to 2MB without affecting the number of cycles it takes to retrieve data from the cache and without reducing the processor frequency.
What can you definitively say about this design?                        (2 marks)
ii) Suppose a creative colleague of yours at Fast Caches, Inc. proposed the following idea. Instead of directly using a number of bits to index into the cache, take those bits and form the index using a hash function implemented in hardware that randomizes the index.
What type of cache misses can this idea potentially reduce?          (2 marks)
iii.What is a disadvantage of the idea other than the additional hardware cost of the hash function?                                                           (2 marks)

iv) Exceptions need to be handled when detected by the processor (and known to be non-speculative) whereas interrupts can be handled when convenient.
a) Why does an exception need to be handled when it is detected? In no more than 20 words, please.                                                    ( 2 marks)
.
b) What does it mean to handle an interrupt \when it is convenient"?( 2 marks)
c) Why can many interrupts be handled \when it is convenient"?( 2 marks)

v) A program spends 75% of its time doing multiply instructions.
a. If the multiplier is sped up by 3x, how much faster does the application run?
(Report your answer as "the program is X times faster.")                (2 marks)
b. What is the limit on the maximum speed up if the multiplier in question above was infinitely fast?
(Report your answer as "the program would be X times faster.")(2 marks)
vi.DMA is worse for large transfers than interrupts due to the overhead of setting up the transfer. True or false. Explain                                        (2 marks)

**QUESTION FOUR ( 20 MARKS)**

a. Define the following addressing modes     ( 5 marks)

    i.    Register indirect mode
    ii.    Auto increment mode
    iii.    Basic index mode
    iv.    Full index mode
    v.    Basic relative and Full relative modes

b. Discuss the difference   between  an interrupt-service routine  and a subroutine.
                     ( 5 marks)

c. Bus lines may be grouped into three types i.e. data, address and control. Discuss Control signals                                                                ( 3 marks)

d. Schemes for timing of data transfers over a bus can be classified into synchronous and asynchronous, discuss the advantages and disadvantages of asynchronous bus
                     ( 4 marks)

e. Discuss the following types of Read-Only Memory                    ( 3 marks)

    i.    Programmable Read-Only Memory (PROM)
    ii.    Erasable Programmable Read-Only Memory (EPROM)
    iii.    Electrically Erasable Programmable Read-Only Memory (EEPROM)


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