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KIRIRI WOMEN'S UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2023/2024 ACADEMIC YEAR
SECOND YEAR, FIRST SEMESTER EXAMINATION
FOR THE BACHELOR OF SCIENCE IN MATHEMATICS
KCS 304 – COMPUTER ARCHITECTURE

Date: 06TH December 2023
Time: 2:30PM – 4:30PM

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

a) Define the following terms:
   i) Computer architecture
   ii) Computer design (3 Marks)

b) With the aid of a diagram explain the Memory hierarchy in a computer System clearly highlighting the distinctive characteristic. (5 Marks)

c) Explain the following memory concepts
   i) Partitioning
   ii) Paging
   iii) Virtual memory (3 Marks)

d) Using a diagram, describe the characteristics and components of a programmable machine based on the Von-Neumann model. (5 Marks)

e) Explain instruction pipelining concept as a performance enhancement technique. (4 Marks)

f) If a computer system registers 39 cache hits and 2 cache misses in a given timeframe, calculate the cache hit ratio as a percentage. (3 Marks)

g) Calculate the size of the tag and the size of the cache index and total number of bits is cache given that the cache is directly mapped with a cache size of 8K, and a Block size = 4 bytes. (4 Marks)

h) Explain what you understand by data representation as applied in Computer Architecture. (3 Marks)

QUESTION TWO (20 MARKS)

a) With the aid of a diagram, outline the steps taken in a basic instruction cycle during instruction processing (7 Marks)

b) Explain the traditional bus architecture found in a computer system and how it differs with the high performance architecture (5 Marks)

c) The way any operand is selected during the program execution is dependent on the addressing mode of the instruction. Describe any four addressing techniques that can be employed in memory referencing. (8 Marks)

QUESTION THREE (20 MARKS)

a) From the functional view of a computer system, decribe the functions that a computer can perform. (6 Marks)

b) Differentiate between the following bus types
   i) Dedicated and Multiplexed
   ii) Synchronous and asynchronous (4 Marks)

c) Briefly explain the role of the cache memory in a typical computer system. (4 Marks)

d) Discuss the following I/O techniques:
   i) Programmed I/O
   ii) Interrupt-driven I/O
   iii) Dynamic memory access (6 Marks)

QUESTION FOUR (20 MARKS)

a) Register is a very fast computer memory, used to store data/instruction in-execution. It is composed of a group of flip-flops with each flip-flop capable of storing one bit of information.
   i) Describe what is meant by a register load. (2 Marks)
   ii) State three special purpose registers and describe their roles. (6 Marks)

b) The transformation of data from main memory to cache memory is called mapping. Mapping helps to improve the performance of a computer with limited internal memory. Describe the three types of mapping in computer systems. (6 Marks)

c) State three differences between Complex Instruction Set Computer (CISC) and Reduced Instruction Set Computer (RISC) microprocessors. (6 Marks)

QUESTION FIVE (20 MARKS)

a) Explain the basic characteristic of flash ROM and its applications in main memory subsystem, 1/0 subsystem and mass storage subsystem. (5 Marks)

b) Explain three functions of ALU in Computer Architecture. (6 Marks)

c) Highlight the main buses carrying information in basic Computer Components. (3 Marks)

d) Explain what you understand by "word" as implied in simple microcomputer system processing. (2 Marks)

e) Discuss the following technologies:
   i) Smart technology (2 Marks)
   ii) Redundant Array of Independent Disks (RAID) (2 Marks)