



COMSATS UNIVERSITY ISLAMABAD
DEPARTMENT OF COMPUTER SCIENCE
Mid Term Examination, Fall 2024

Class/Section: -BCS-6A/B, BSAI-6, BCT-6, BDS-6/7

Subject: CSC325 – Computer Organization & Assembly Language

CSC321 – Microprocessor and Assembly Language

Maximum Marks: 50

Time Allowed: 80 Minutes.

Dated/time: Nov 5, 2024. 1300-1420

Instructor: - Taimur Shahzad/Muhammad Mustafa/Raja Rashid Mehmood/Madiha Naveed

CLO-1 Articulate the components of a computer system along with its architecture

Question-1)

[Marks – 4x3=12]

- Using a diagram describe the hardware organization of an IA-32 microcomputer.
- Explain the 8086 Intel's Instruction Set Architecture (16-Bit ISA) and its format.
- Find the IEEE-754 32-bit floating point binary representation of $(-169.15625)_{10}$

CLO-2 Review Memory Systems and Its' Hierarchy along with I/O Methods

Question-2)

[Marks – 2+5+5=12]

- Give a detailed comparison between Static and Dynamic memory
- With the help of a diagram depict and justify the need of memory hierarchy in a computer system.
- Keeping in view the IA-x86, what will be the values/contents stored in RAM, in hexadecimal form, against the following data declarations if the offset address of the first variable is 100:

(Note: the ASCII code of character A is 65)

```
.data
Val1 DW 254
Val2 DW -352Ah
X DD -32000
Y DQ 64000
Z DB "ABC", 10, 13, 0
```

CLO-3 Compute performance of the CPU**Question-3)****[Marks – 4+3x3=13]**

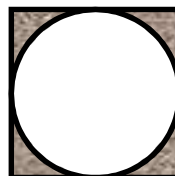
a) Given the following program instruction types, their frequency and number of cycles each type of instruction takes to execute. Calculate the number of clock cycles used by the entire program.

Instruction Type	Frequency	CPU Cycles
T1	5	3
T2	3	4
T3	5	2
T4	2	1

- b) In this problem, you will analyze the performance of two implementations of set an instruction architecture:
- In the 1st implementation, the clock rate is 1 GHz, and instructions fall into two categories. Category *X* instructions require 4 cycles to execute, while category *Y* instructions require 5 cycles. If a program executes 1.27×10^{11} category *X* instructions and 1.01×10^{11} category *Y* instructions, how long will it take to execute?
 - The 2nd implementation is identical to the first, except that the clock rate is 1.2 GHz and category *Y* instructions require 6 cycles. How long will the program take to execute on this implementation?
 - Amongst the two, which implementation is faster for the given program, and by how much?

CLO-4 Demonstrate Assembly Language Capabilities**Question-4)****[Marks – 3+10=13]**

Design a low-level algorithm and write a complete assembly language program that allows a user to calculate the shaded area between circle and square in the following figure and store it in memory. The only known quantity is the radius of circle which is 12. Ignore the fractional part during the computation. Recall that area of circle = $\pi \times \text{radius}^2$, area of square = length $\times$ length, and diameter of circle = $2 \times \text{radius}$. You can approximate π as $\frac{22}{7}$.



Best of Luck