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Daffodil International University

Faculty of Science & Information Technology
Department of Computing and Information System
Final Examination, Spring-2024
Course Code: CIS131, Course Title: Computer Architecture and Organization
Level: 1 Term: 2

Exam Duration: 2 Hours | Marks: 40

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	(a)	Describes different types of computer components with a proper diagram. How to compare performance of different CPUs?	[4+3]	CO1 L-1,
	(b)	Summarize the eight great ideas of Computer Architecture.	[3]	
2.	(a)	Consider three different processors, P1, P2 and P3, executing the same instruction set with the following Clock Rates and CPI's:	[5]	CO2 L-5

Processor	Clock Rate	CPI
P1	3	1.5
P2	2.5	1
P3	4	2.2

I. Which processor has the highest performance expressed in million instructions per second?
II. If the processors each execute a program in 15 seconds, find the number of cycles and the number of instructions.
III. We are trying to reduce the execution time by 30% but this leads to an increase of 20% in the CPI. What clock rate should we have to get this time reduction?

	(b)	Why Computers use 2's complement in representing signed integers?	[2]
	(c)	Convert $(-5XX.80)_{10}$ in IEEE-754 32-bit floating point number with your final answer represented in hexadecimal. [XX = Last two digits of your Student ID]	[5]

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3.	(a)	List out the steps of designing the combinational circuit.	[3]	CO4 L-5
	(b)	In class, **Mr. Abdullah** is hardly trying to design a circuit that converts four bits binary code to gray code. But he noticed that some conversions provide wrong answers. After that, he is going to **Mr. Mehedi** to discuss the issues. Besides, two friends are deeply studying where there is something wrong. Finally, find out the problems and successfully design the corresponding circuit. Now, *Visualize the designed circuit (Simplification is done by K-Map) that is made by **Mr. Abdullah** using different logic gates.*	[5]	
	(c)	Design a circuit with four inputs and an output that is to be **HIGH** only when input *A* (*A* is a MSB) is **LOW** at the same time that exactly two other inputs are **LOW**.	[4]	
4.		What is the purpose of pipeline techniques in computer architecture? Due to 4 stage pipelining used a processor executes 6 instructions within 9 units of time. Suppose, one of the students (say **Mr. Sisir**) can execute the above instructions in which each stage is completed in 3 seconds. Now, *Can you visualize the systems that are executed by **Mr. Sisir**? If yes, then demonstrate each stage. Besides, also show how much (%) execution time is saved owing to using pipelining technique.*	[6]	CO3 L-2

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Faculty of Science & Information Technology
Department of Computing and Information System (CIS)
Final Exam, Fall-2024
Section A
Course Code: CIS 131
Course Title: Computer Architecture & Organization

Time: 2 Hours **Total Marks: 40**

(The figure of the right margin indicates the marks)

(You need to answer all of the following questions)

1.	a) Discussed the key changes from 1st generation computers to 5th generation computers. b) Describe the basic organization of the computer system with a proper diagram.	4 4	CLO1
2.	a) Assume a 20 cm diameter wafer has a cost of 15, contains 100 dies, and has 0.030 defects/cm^2 & also a 25 cm diameter wafer has a cost of 18, contains 116 dies, and has 0.041 defects/cm^2. a. Find the yield of both wafers. b. Find the cost per die for both wafers. c. If the number of dies increased by 15% and the defects per area unit increased by 20% find the die area and yield. b) A program runs in 10s on computer A, which has a 2.5 GHz clock. We are trying to help a computer designer build a computer B, which will run this program in 8s. The designer wants to increase the clock rate but this increase will affect the rest of the CPU design causing computer B to require 1.3 times as many clock cycles as computer A for this program. i. What clock rate should we tell the designer to target?	6 4	CLO2
3.	a) If the decimal value of 'b' is 98, find out both the decimal and binary values of 'x' and 'y'. b) Subtract 100011 from 010010 using the complementary method. c) Convert $(-5XX.80)_{10}$ in IEEE-754 32-bit floating point number representation. Where **XX** represents the last two digits of your Student ID.	2 2 6	CLO3
4.	a) Implement a Full Adder circuit using Two Half Adders and an OR Gate. b) Simplify the given 4 variables Boolean using the K-Map and draw the circuit. $F(A, B, C, D) = \Sigma(0, 1, 2, 5, 7, 8, 9, 10, 13, 15)$ c) Implement an Encoder of 8 inputs and draw the circuit.	4 4 4	CLO4