National University of Computer and Emerging Sciences

Karachi Campus

Computer Architecture (EE-3009) Sessional-I Exam

Date: February 26th 2025

Course Instructor(s)

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Total Time (Hrs): 1

Total Marks: 30

Total Questions: 4

Roll No _____ Section _____ Student Signature _____

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INSTRUCTION: Attempt all the questions in-order.

CLO # 1 **Describe the performance evaluation criteria of computers and recognize performance of different computing systems.**

Q1: Logical Reasoning **[3x 2=6 Marks]**

i. According to Flynn's Taxonomy, how parallelism can be achieved in a multi-processor environment.

ii. How can energy efficiency be improved despite constant clock rates and supply voltages?

iii. How the reliability of a system can be improved? Considering metrics like MTTF, MTTR and MTBF.

CLO # 1 **Describe the performance evaluation criteria of computers and recognize performance of different computing systems.**

Q2: Consider two different machines, with two different instruction sets, both of which have a clock rate of 200 MHz The following measurements are recorded on the two machines running a given set of benchmark programs: **[9+1= 10 Marks]**

Instruction Type	Instruction Count (millions)	Cycles per Instruction
Machine A		
ALU	8	1
Load and Store	4	3
Branch	2	4
Others	4	3
Machine B		
ALU	10	1
Load and Store	8	2
Branch	2	4
Others	4	3

a. Determine the effective CPI, MIPS rate, and execution time for each machine.

b. Comment on the results.

***CLO # 1* Describe the performance evaluation criteria of computers and recognize performance of different computing systems.**

Q3: When parallelizing an application, the Overall speed is enhanced based on number of processors/core within a system. This is limited by two things: percentage of the application that can be parallelized and the cost of communication. Amdahl's law takes into account the former but not the latter. **[3.5 x2 = 7 Marks]**

a. What is the speedup with N processors if 80% of the application is parallelizable, ignoring the cost of communication?

b. Compute the speedup with 8 processors if, for every processor added, the communication overhead is 0.5% of the original execution time.

***CLO # 1* Describe the performance evaluation criteria of computers and recognize performance of different computing systems.**

Q4: Consider an Intel Pentium 4 processor with 2 GHz frequency and 3.3 operating voltage. The processor is designed to have adjustable voltage, so that 12% reduction in voltage may result in 10% reduction in frequency. What would be the impact on dynamic energy and on dynamic power?

[3.5 x2 = 7 Marks]

========== **Good Luck** ==========