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Department of Computer Science and Engineering
B. Sc. in CSE
Semester Final Examination 2017 (Jan-Jun)
Level 3 Semester I, Course Code: CSE 309, Credit: 3.0
Course Title: Computer Architecture (Theoretical)

Time: 3 Hours

Total Marks: 90

[N.B. The figure in the right margin indicates the marks allocated for respective question, all the portions of each question must be answered consecutively]

Section-A
Answer any THREE

1. a) What is computer architecture? Is there any impact of computer architecture on its performance? 1+3

   b) What are the four main functions of a computer? Discuss each in detail. 6

   c) Draw the structure of IAS computer and describe in short. 5

2. a) Describe the top level view of the components in a computer system with diagram. 6

   b) What is the use of interrupts in a computer system? Describe its different classes. 2+3

   c) What is the benefit of using a multiple-bus architecture compared to single-bus architecture? 4

3. a) What is the difference between random-access and non-random access memory? Derive the equation for the time taken to read **n** bits for a non-random memory. 2+4

   b) Is it possible to run a computer system without cache memory? Justify your answer. 3

   c) Explain L1, L2, and L3 cache. What is the necessity of having different levels of cache memory? 2+1

   d) Assume a memory access to main memory on a cache "miss" takes 20 ns and a memory access to the cache on a cache "hit" takes 2 ns. If 75% of the processor's memory requests result in a cache "hit", what is the average memory access time? 3

4. a) What is SSD? Describe its advantages compared to HDD. 1+3

   b) Suppose you have a data file of size 512 MB, is it possible to store that file in a properly formatted disk of size 512 MB? Explain your answer. 1+2

   c) Draw and describe a basic block diagram of external devices for a computer system. 3

   d) Describe the following terms: Dual-core, Core 2 Duo, Pentium D, Core i3, and Core i7. 5

Section-B

Answer any THREE

1. a) Write difference(s) between SRAM and DRAM.

   b) Describe DDR technology and its different categories in short. 4

   c) In which kind of memory system MR sensor is used? 3

   d) What is disk formatting? Describe a typical disk formatting mechanism with diagram. 4

2. a) Define CPI, MIPS, MFLOPS, and GPGPU. 6

   b) Consider the execution of a program which results in the execution of 2 million instructions on a 400-MHz processor. The program consists of four major types of instructions. The instruction mix and the CPI for each instruction type are given below based on the result of a program trace experiment: 6

Instruction Type	CPI	Instruction Mix (%)
Arithmetic and logic	1	60
Load/store with cache hit	2	18
Branch	4	12
Memory reference with cache miss	8	10

   Calculate average CPI, and corresponding MIPS rate.

   c) Describe the impact of Moore's law on computer architecture. 3

3. a) List the drawback(s) of interrupt driven I/O and suggest solution(s) for each of them. 2+2

   b) Draw and describe a typical DMA block diagram. 4

   c) When a DMA module takes control of a bus, and while it retains control of the bus, what does the processor do? 3

   d) *"In positional number system, value of a number is defined as* $\sum_i (a_i \times b^i)$ Explain this statement with an example of six-base number system. 4

4. a) What is pipelining? Describe the functions of each of the five pipelined stages. 1+5

   b) Describe different types of memory addressing modes in short. 4

   c) List two advantages of a multi core processor over a single core one. 2

   d) Does the increase of clock speeds always increase the processing speed of a computer system? Justify your answer. 3