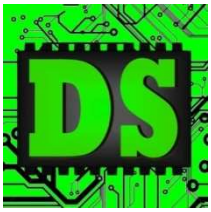

EEE4084F – Digital Systems

15 May 2013

Quiz 4 – Take-home assignment

Lectures: 16, 17, 18, 19, 20;
Textbook: Ch24, pages: 463-469; 473; 475-47

Question 1: HPEC Trends:

1.1. From the late 1980's to mid 2000's HPEC trends changed, briefly identify what characterized each new trend and the factor(s) that led to this change. [6]

ANSWER:

1980's to early 1990's Application Specific Hardware [1 mark]
- Custom design
- COTS parts
- Non-portable software [1 mark]

1990's to 2000's General Purpose Programmable Hardware [1 mark]
- Vendor specific software
- DoD Mandate
- Portable software library
- Legacy Software [1 mark]

2000's to mid 2000's Hybrid [1 mark]
- Balance Architecture
- Custom front-end with COTS back-end
- Software Standards [1 mark]

1.2. Briefly explain what is meant by a Distributed Net-Centric Architecture. [4]

ANSWER:

Distributed Net-centric Architecture
- Distributed worldwide nodes shaped into a multi-layered network.
- Requires the Global Information Grid
- Internet like infrastructure for communications
- Multiple users access to varying amounts of sensor data.
- Massive ground based data centres.

Question 2: Reconfigurable Computing

2.1. Define what is meant by Reconfigurable Computing. [1]

Answer:

Capable of dynamically changing datapaths either during compile time or runtime. [1 Mark]

2.2. Identify and briefly explain the different RC Architectures. [4]

Answer:

Microprocessor based [1 mark]

Features that allow rerouting of links to hardware.

Multi-core system able to create larger or smaller computing cluster as needed [1 Mark]

FPGA based [1 Mark]

Smaller scale of interconnects, generally between blocks. [1 mark]

Question 3: Amdahl's Law

	A	**B**	**C**
Parallelizable Code	50%	85%	20%

3.1. Given access to processors with of 1, 4 and 16 cores, and knowing the percentage of parallelizable code in functions A, B and C. Determine speed up factor achieved by Amdahl's Law. [4]

Answer:

	1	**4**	**16**
A	1	1.6	1.8
B	1	2.75	4.9
C	1	1.18	1.23

[4 mark]

3.2. Having calculated the speedup using Amdahl's Law, do you believe this to be an accurate result? Justify your answer. [3]

Answer:

[3 mark]

Question 4: RC Building Blocks

4.1. Give examples of Volatile and Non-Volatile memory and mention the drawbacks and advantages of each, then explain what the term Volatile means. [4]

Answer: See Notes

Volatile:

SRAM

Fast, but expensive [1 mark]

Non-volatile:

Flash

erasable and programmable, but limited number of writes [1 mark]

Volatile requires power; loss of power equals loss of data. [2 mark]

4.2. Identify 2 configurations of Direct Memory Access (DMA) and briefly explain the implications of DMA on a CPU. [4]

Answer:

Standard Block Transfer, Demand-mode transfer, Fly-by transfer, Data-chaining transfer [2 mark]

Peripherals allowed access to memory via a bus, without DMA peripherals need to make requests to the CPU to get information. [2 mark]

Question 5: Benchmarking and Automatic Conversion

5.1. Whetstone, Dhrystone and CoreMark are tools for benchmarking processors, briefly explain what any two of these tools and explain how results obtained from these tools are useful. [3]

Answer:

See Lecture slide 20 [3 mark]

5.2. Briefly mention 2 of the challenges encountered when converting from C to VHDL. [2]

Answer:

See lecture slide 20 [3 mark]

Total: 35