UNIVERSITI SAINS MALAYSIA

Second Semester Examination
2013/2014 Academic Session

June 2014

EEE 523/4 – HARDWARE AND SOFTWARE CO-DESIGN

Duration : 3 hours

Please check that this examination paper consists of **THREE (3)** pages printed material before you begin the examination.

Instructions: This question paper consists of **FIVE (5)** questions. Answer **FOUR (4)** questions. All questions carry the same marks.

1.   (a)   As complexity of electronic design increases tremendously, designs are made at a higher abstraction levels. Describe the various abstraction levels and the details of they entailed associated to electronic circuit for system design and analysis. Name some of available tools for such design.

(15 marks)

      (b)   Figure 1 shows the paths taken between hardware and software part of an electronic system design. Elaborate on the differences between classical and modern electronic system design and outline the benefits of Hardware Software Co-design approach.
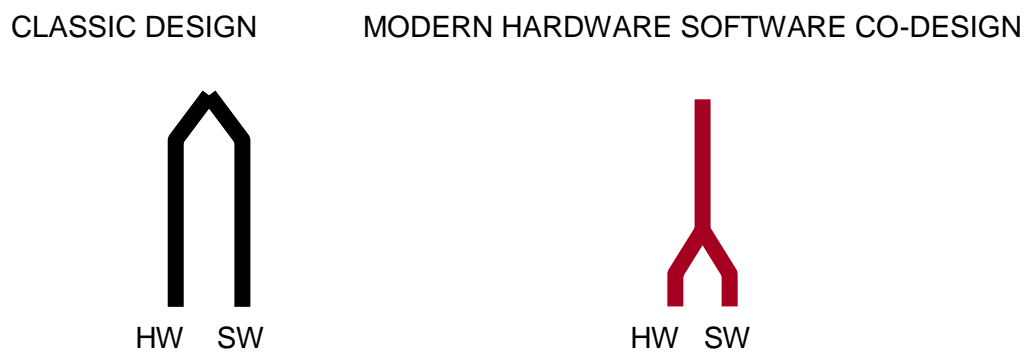
CLASSIC DESIGN   MODERN HARDWARE SOFTWARE CO-DESIGN

HW   SW   HW   SW

Figure 1 : Classical versus Modern Hardware & Software System Design

(10 marks)

2.   (a)   "Fast growth in both VLSI design and Software engineering has raised awareness of similarities between the two, especially related to hardware synthesis, programmable logic and description languages."

Elaborate on the above statement.

(10 marks)

      (b)   For embedded hardware design, few technologies are available. Namely Processor-based, ASIC and FPGA. Briefly describe these technologies and explain the pros and cons of each of the above technologies.

(15 marks)

3. (a) Hardware/Software Partitioning describes the process of deciding for each subsystem, whether the required functionality is more advantageously implemented in hardware or software. What are the issues and techniques in consideration during the partitioning process?

(15 marks)

(b) Hardware Synthesis is defined as the automatic design and implementation of hardware from a specification written in a hardware description language. Draw the flowchart of the synthesis process and describe overall process.

(10 marks)

4. The shaded part of Figure 2 depicts the co-synthesis process. Describe in detail the iteration, based on the figure, how an optimum composition of hardware and software of the system is arrived.
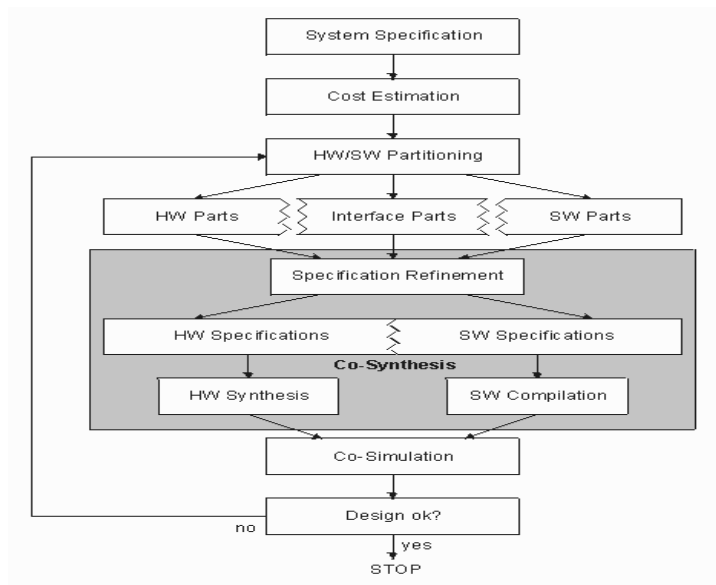

Figure 2 : Co-synthesis of the Co-design Process

(25 marks)

5. Based on your experience using Vivado Design System and Zedboard Prototyping System, describe the Hardware/Software Co-design of an application of your choice based on a Linux operation system. Your example should exhibit the flexibility of changing between hardware and software components of the design.

(25 marks)

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