Assignments on Computer Organization and Architecture

CS-350: Computer Organization

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Textbook:

(1) CARPINELLI, JOHN D. (2001). *Computer System Organization and Architecture.* Boston, MA: Addison-Wesley Longman. QA76.9.C643 C37 2002; 004.2'2—dc21; 00-055836; ISBN 0-201-612534. Web-site support for this text is to be found at: http://occawlonline.pearsoned.com/bookbind/pubbooks/carpinelli_awl/

Assignment 1:

Positional Number Representation, Non-Explicitly-Signed ("Unsigned") Binary Numbers, and Basic Digital Logic:

REQUIRED READINGS:
1. Tutorial on the Representation of Numbers in Digital Computers, and on Digital Integer Arithmetic, pages 1-17.
2. Carpinelli's Chapter 1: *Digital Logic Fundamentals,* sections 1.1-1.2 (pages 1-16).

RECOMMENDED READING:
3. Chapters 1 (*Analog versus Digital*), 2 (*Atoms, Molecules, and Crystals*), 3 (*Conductors and Insulators*), 4 (*Semiconductors*), 5 (*Primitive Logic Functions*), 6 (*Using Transistors to Build Primitive Logic Functions*), 7 (*Alternative Numbering Systems*), and 9 (*Boolean Algebra*) in:

> Mᴀxꜰɪᴇʟᴅ, Cʟɪᴠᴇ Rɪᴄʜᴀʀᴅ (1995). *Bebop to the Boolean Boogie. An Unconventional Guide to Electronics Fundamentals, Components, and Processes.* Solana Beach, CA: HighText Publications. TK7868.D5M323 1995; 821.39'5—dc20; 94-41062; ISBN 1-878707-22-1.

Rᴇᴠɪᴇᴡ & Sᴛᴜᴅʏ: Review Questions on Digital Number Representation**, particularly questions 6, 7, 8, 9, 10, and 11. Try answering each of these questions by yourself, without looking at the answers that appear later in the document. Afterwards, check in the second part of the document to see if your answers are correct.

Dᴇʟɪᴠᴇʀᴀʙʟᴇ, Pᴀʀᴛ 1: Carpinelli Chapter 1, questions 1 through 9. Hand in your answers to these questions in hardcopy form on the due date for Assignment 1. A good-faith effort to solve each of these problems is required for you to receive full credit for this assignment, regardless of whether your answers are right or wrong.

Dᴇʟɪᴠᴇʀᴀʙʟᴇ, Pᴀʀᴛ 2: Write five short-answer questions usable in a quiz or in an examination, based upon both the required readings for the current week and the material covered in class during the week. A question can be either of two types: Multiple-Choice or True-False, but AT MOST two of your questions can be True-False; three or more must be Multiple-Choice. Fill-in-the-Blank questions are NOT acceptable.

(1) True-False. EXAMPLE: The capital of Montana is BILLINGS.

(2) Multiple-Choice EXAMPLE I: The capital of Montana is:
> (a) Missoula.
> (b) Butte.
> (c) Helena.
> (d) Billings.
> (e) Great Falls.
> (f) none of the above.

(3) A question of the multiple-choice type must have three OR MORE specific choices enumerated, PLUS an additional final choice of "none of the above". Additional choices of "all of the above" and "more than one, but NOT all of the above" should also appear whenever such choices are consistent with question content. For obvious reasons, the correct sequence should be "all of the above" in the third-from-the last position, followed by "more than one, but NOT all of the above" in the next-to-last position, and finally "none of the above" as the last choice. In the sample Multiple-Choice question that appears above, it is impossible for a state to have more than one capital, and therefore after five enumerated cities, there appears only a "none of the above", but not an "all of the above" and not a "more than one, but NOT all of the above." In the following example, all three general choices are appropriate, and therefore they are all present:

Revised 15 Jan 2004

(4) Multiple-Choice EXAMPLE II: Cities which are state capitals are:
>   (a) Albany, NY.
>   (b) Trenton, NJ.
>   (c) Chicago, IL.
>   (d) Sacramento, CA.
>   (e) all of the above.
>   (f) more than one, but NOT all, of the above.
>   (g) none of the above.

(5) You MUST indicate what *you* think is the correct answer to each of your questions, along with a thorough, but *brief* explanation of your answer, unless the reason is obvious. This should be done in the following format:

>   1. The capital of Montana is BILLINGS.
>
>   *Answer*: FALSE — The capital is Helena.
>
>
>   2. The capital of Montana is:
>   (a) Missoula.
>   (b) Butte.
>   (c) Helena.
>   (d) Billings.
>   (e) Great Falls.
>   (f) none of the above.
>
>   *Answer*: c   (explanation unnecessary in this case; the correct
>   answer explains itself)
>
>
>   3. Cities which are state capitals are:
>   (a) Albany, NY.
>   (b) Trenton, NJ.
>   (c) Chicago, IL.
>   (d) Sacramento, CA.
>   (e) all of the above.
>   (f) more than one, but NOT all, of the above.
>   (g) none of the above.
>
>   *Answer*: f — The capital of Illinois is not Chicago but Springfield; the
>   other cities are all capitals of their states.

Revised 15 Jan 2004

4. Cities which are state capitals are:
> (h) Wilmington, DE.
> (i) Baltimore, MD.
> (j) Dallas, TX.
> (k) Augusta, GA.
> (l) all of the above.
> (m) more than one, but NOT all, of the above.
> (n) none of the above.

> *Answer*: a — The capital of Maryland is Annapolis, the capital of Texas
> is Austin, and the capital of Georgia is Atlanta..

(6) To receive credit for your homework, your questions ***must*** be submitted in the body of an E-mail message (***not*** as an attachment), and the subject field of the E-mail ***must*** be of the form: **CS-350-*n*-Assignment -1**, where **_n_** is the section number.

Assignment 2:

Intermediate Digital Logic:

REQUIRED READINGS:
1. Carpinelli's Chapter 1: *Digital Logic Fundamentals,* sections 1.3-1.4 (pages 16-34).

RECOMMENDED READING:
2. Chapters 10 (*Karnaugh Maps*) and 11 (*Using Primitive Logic Functions*) in: MAXFIELD, CLIVE RICHARD (1995). *Bebop to the Boolean Boogie. An Unconventional Guide to Electronics Fundamentals, Components, and Processes.* Solana Beach, CA: HighText Publications. TK7868.D5M323 1995; 821.39'5—dc20; 94-41062; ISBN 1-878707-22-1.

REVIEW & STUDY: <u>Review Questions on Digital Number Representation</u>**,** particularly questions 5, 10, and 11. Try answering each of these questions by yourself, without looking at the answers that appear later in the document. Afterwards, check in the second part of the document to see if your answers are correct.

DELIVERABLE, PART 1: Carpinelli Chapter 1, questions 16, 18, and 21. Hand in your answers to these questions in hardcopy form on the due date for Assignment 2. A good-faith effort to solve each

of these problems is required for you to receive full credit for this assignment, regardless of whether your answers are right or wrong.

Dᴇʟɪᴠᴇʀᴀʙʟᴇ, Pᴀʀᴛ 2: Write five short-answer questions usable in a quiz or in an examination, based upon both the required readings for the current week and the material covered in class during the week. A question can be either of two types: Multiple-Choice or True-False, but AT MOST two of your questions can be True-False; three or more must be Multiple-Choice. Fill-in-the-Blank questions are NOT acceptable.

Further details of this assignment are the same as described in the numbered paragraphs under "Dᴇʟɪᴠᴇʀᴀʙʟᴇ, Pᴀʀᴛ 2" for Assignment 1, except that the E-mail subject heading should now read: **CS-350-*n*-Assignment -2** (instead of **Assignment-1**), and *n* is the section number.

Assignment 3:

Advanced Digital Logic:

Rᴇǫᴜɪʀᴇᴅ Rᴇᴀᴅɪɴɢs:
1. Carpinelli's Chapter 1: *Digital Logic Fundamentals,* sections 1.5-1.8 (pages 16-34).

Rᴇᴄᴏᴍᴍᴇɴᴅᴇᴅ Rᴇᴀᴅɪɴɢ:
2. Chapters 14 (*Integrated Circuits*) and 16 (*Programmable ICs*) in: Mᴀxғɪᴇʟᴅ, Cʟɪᴠᴇ Rɪᴄʜᴀʀᴅ (1995). *Bebop to the Boolean Boogie. An Unconventional Guide to Electronics Fundamentals, Components, and Processes.* Solana Beach, CA: HighText Publications. TK7868.D5M323 1995; 821.39'5—dc20; 94-41062; ISBN 1-878707-22-1.

Dᴇʟɪᴠᴇʀᴀʙʟᴇ, Pᴀʀᴛ 1: Carpinelli Chapter 1, questions 25, 26, and 27. Hand in your answers to these questions in hardcopy form on the due date for Assignment 3. A good-faith effort to solve each of these problems is required for you to receive full credit for this assignment, regardless of whether your answers are right or wrong.

Dᴇʟɪᴠᴇʀᴀʙʟᴇ, Pᴀʀᴛ 2: Write one question that can be used as a Review Question that can provide a means of practice for your fellow-students to test their understanding of the ***digital logic*** material covered in ***Assignments 1, 2,*** and ***3***, as well as the material on this subject that was covered in class. Do NOT duplicate the coverage of the review questions on digital number representation that were assigned for you to answer in ***Assignments 1*** and ***2,*** but instead restrict your coverage to the digital logic subject matter for which review questions have not been provided. Submit

Revised 15 Jan 2004

not only the question that you compose, but also its worked solution. Submit your question and its solution in the form of a Microsoft Word document enclosure to an E-mail message. The subject heading for your E-mail should read: **CS-350-*n*-Assignment -<u>3</u>**, where *n* is the section number.

Assignment 4:

Finite State Machines:

R<small>EQUIRED</small> R<small>EADINGS</small>:
1. Carpinelli's Chapter 2: *Introduction to Finite State Machines,* sections 2.1 and 2.3 (pages 51-56 and 58-66).

R<small>ECOMMENDED</small> R<small>EADING</small>:
2. Chapter 12 (*State Diagrams, State Tables, and State Machines*) in: M<small>AXFIELD</small>, C<small>LIVE</small> R<small>ICHARD</small> (1995). *Bebop to the Boolean Boogie. An Unconventional Guide to Electronics Fundamentals, Components, and Processes.* Solana Beach, CA: HighText Publications. TK7868.D5M323 1995; 821.39'5—dc20; 94-41062; ISBN 1-878707-22-1.

D<small>ELIVERABLE</small>, P<small>ART</small> 1: Carpinelli Chapter 2, questions 1, 2, 3, 9, and 15. Hand in your answers to these questions in hardcopy form on the due date for Assignment 3. A good-faith effort to solve each of these problems is required for you to receive full credit for this assignment, regardless of whether your answers are right or wrong.

D<small>ELIVERABLE</small>, P<small>ART</small> 2: Write one question that can be used as a Review Question that can provide a means of practice for your fellow-students to test their understanding of the ***finite state machine*** material covered in ***Assignment 4***, as well as the material on this subject that was covered in class. Submit not only the question that you compose, but also its worked solution. Submit your question and its solution in the form of a Microsoft Word document enclosure to an E-mail message. The subject heading for your E-mail should read: **CS-350-*n*-Assignment -<u>4</u>**, where *n* is the section number.

Revised 15 Jan 2004