

University of Cape Town
Department of Computer Science
Computer Science CSC305H

November Examination, November 2005

- Please show all your work in arriving at an answer since the reasoning is more important than merely a correct answer.
- Please write the numbers of the questions you answered on the front cover.

Marks: 50

- Approximate marks per question are shown in brackets

Time: 1.5 hours

- The use of calculators is permitted
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Section 1. Compilers

Answer Questions 1, 2, 3 and 4 for a total of 25 marks

Answer this section in a separate book.

Question 1. This question is compulsory [6 marks]

- a) What does the scope of a variable refer to? Is it necessary to have more than one scope in a program? Explain why or why not. [3]
- b) What is an activation record? Are stack-based activation records always necessary? Discuss why or why not. [3]

Question 2. This question is compulsory [6 marks]

- a) Assuming the IR tree language in the attached pages, convert the following program fragment to an equivalent IR tree. (Assume a/b/c/d/e are stack frame variables at offsets k0/k1/k2/k3/k4 from the frame pointer special temporary fp) Provide the final tree and do not use the Nx/Cx/Ex expression types/objects.

$a = b + (c * d) - e;$

[4]

- b) When canonicalising IR trees (using the transformations in the attached appendix), ESEQ instructions are eventually eliminated - explain how this happens. [2]

Question 3. This question is compulsory [8 marks]

- a) In a CISC machine, it may be naive to assume that every tile in an instruction set has an identical cost. Explain what factors could affect the cost of tiles. [2]
- b) Some machines have fewer registers than others - how is this handled during instruction selection? [2]
- c) Using the attached instruction set, apply the Dynamic Programming tiling algorithm to the following IR tree. Show the costs at each node in the tiled tree and list the instructions generated.

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TIMES ( CONST a, MEM ( PLUS ( CONST b, CONST c ) ) )
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[4]

Question 4. This question is compulsory [5 marks]

- a) Describe what occurs in each step of the typical simplify-coalesce-freeze-spill-select graph colouring algorithm for allocating registers to temporaries based on an interference graph. [5]

Section 2. Web-based Computing

Answer Question 5 and EITHER Question 6, 7 or 8 for a total of 25 marks

Answer this section in a separate book.

Question 5. This question is compulsory [15 marks]

- a) Draw a diagram of the web services architecture stack. Explain the three major roles in the stack and the interactions between these roles. In addition show where Web Services Choreography Language fits within the stack and explain its purpose. [15]

Question 6. [10 marks]

- a) Describe the testing process in Web Services with particular reference to scalability and the need to do load testing. [10]

Question 7. [10 marks]

- a) We discussed the Extensible Access Control Markup Language, or XACML, approved by OASIS (Organization for the Advancement of Structured Information Standards). Explain, with the aid of a diagram, the Key concepts of XACML in the Web Services paradigm. Compare the role of OASIS with that of W3. [10]

Question 8. [10 marks]

- a) In Lectures we discussed 12 steps to SOA. Choose 5 of these steps which you think are important, provide a clear motivation for your choice and explain the value of the step in designing a SOA. [10]