

CS6235 Quiz 2 Exam: Mar 29 2022

Maximum marks = 20, Time: 50.00 minutes

Name: _____ Roll: _____

- Write your roll number on the main answer book and all the additional.
 - Each question in Section 1 is for four marks.
 - There are two sections in the question paper.
 - Descriptive type: Answer any four out of the five questions.
 - True or False: Each incorrect True/False answer will lead to a deduction of 0.5 mark.
 - Start the answer to each question on a new page.
 - Advise: work out each question separately and legibly.
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Section 1. Descriptive type

1. Call Graph.

- (a) State minimal restrictions on TACoJava such that CHA on the restricted programs will lead to a precise call graph; assume that the analysis remains oblivious to the values of the predicates of different conditional statements. [2 marks]
- (b) State minimal restrictions on C such that we can identify the target of each call-site in the restricted C programs, without needing points-to analysis. [2 marks]

2. Analysis dimension.

- (a) State minimal restrictions on TACoJava such that context insensitive points-to analysis on the restricted TACoJava programs will always give the same results as context sensitive analysis. [2 marks]
- (b) Say you have been given a variant of TACoJava, where it is guaranteed that no variable (local or parameters) is defined more than once. Under such a restriction, will a flow insensitive analysis give the same precision as flow sensitive analysis? [2 marks]

3. Points-to analysis and call-graph construction. Write a Java code that shows that a points-to analysis and call-graph construction have a phase ordering relation between them. [4 marks]

4. MHP analysis. For the MHP analysis (for Java) studied in the class, answer the following questions:

- (a) While computing the *KILL* sets for the `notify` nodes, why do we will kill the corresponding “waiting-nodes” only if there is exactly one such “waiting-node”, whereas if the node is a `notifyAll`, we *KILL* all the corresponding waiting-nodes? [2 marks]
- (b) Give the rules to compute the “inverse” maps, such that the symmetric nature of the MHP maps can be maintained. [1 mark]
- (c) What will happen if the rule to compute the *OUT* maps is changed to $OUT(n) = M(n) \cup (GEN(n) - KILL(n))$. [1 mark]

5. **Dynamic Data Race Detection.** If a Java program has a data-race then it will be detected by a Happens Before (HB) analysis based data-race detection scheme in some execution trace. Do you agree? Support your answer with an explanation. [4 marks]

Section 2. True/False (1 mark each)

- _____ Since TACoJava does not support nested blocks, a symbol table implementation does not need to implement `beginScope` and `endScope` operations.
- _____ Different compilers of C language may use different IRs.
- _____ The 3-address code discussed in the class, is an example of graphical IR.
- _____ A compiler can only use three IRs: High, Medium and Low
- _____ In the DAG form of an IR, each variable has exactly one node.
- _____ The `addAsync` function, takes advantage of the fact that an `async` node is responsible for the MHP relation between the body of the `async` and all the statements reachable after executing the `async` node.