2021-2022 Final

1. What are the language evaluation criteria?
2. What is the relationship between inheritance and sub-typing?
3. What are the advantages and disadvantages of functional programming?
4. Birkaç tane programlama dili verilmiş. Write for each programming language, if it is strongly typed or weakly
5. What is the difference between abstract classes vs interfaces?
6. What is the difference between an abstract class with pure virtual function in C++ vs interfaces in Java?
7. What is the difference between procedures and functions? Write 3 examples.
8. What is a module and how is it useful for ADTs?
9. What does Java use instead of modules, and how is it different from modules? (Answer: Java uses packages
10. What is the advantages of dynamic scoping over static scoping?
11. Java does not allow static binding, compared to C++. Advantages and disadvantages?
12. How smalltalk handles multiple inheritance?
13.1. Bir dilin kuralları verilmiş. Variable'lar yazılmış, function'lar yazılmış. Küçücük bir program verilmiş. Outpu
13.2. Write a CFG for how the language handles function. Write the parsing tree for the function.
14. Link listed verilmiş. Write an algebraic sequence for the following ADT. Using the following operations: is_e
15. 3 şıklı Lisp sorusu. Binary Search Tree verilmiş; List içerisinde node var (bunun içerisinde de sayılar). Left tre
16.1. Prolog sorusu. n^{th} Fibonacci sayısı çıkaran bir program istenmiş. 3'üncü Fibonacci sayısı 2 döndürmesi lazı
16.2. Fibonacci için bir tane query verilmiş. Senin yazdığın programa göre o query nasıl parse'lanır?
17. What is a Predicate, function, Horn clause? Explain.

```
11. Java does not allow static binding, compared to C++. Advantages and disadvantages?

12. How smalltalk handles multiple inheritance?
```

2021-2022 Final Mazeret

```
Verilen production rule için Shift-Reduce Parser yapın. 8p

Smalltalk ve javascript arasındaki temel farklar nelerdir? Hangi
durumda hangi dili kullanırdınız? 3p

Prolog ile sudoku çözen algoritma yazın. 12p

Type Checking ve Type inference arasındaki farklar nelerdir? 3p


Bir dilin kuralları verilmiş.
-A şıkkı: Bu dilin CFG'sini yaz Parse Tree'sini çiz. 10p
-B şıkkı: Dilin attribute gramerini yaz. 10p
-C şıkkı: Kuralları verilen dil neden fonksiyonel bir dildir? Dilin ADT'yi
sağlaması için neler eklenebilir? 10p


Lisp, liste ile graph yapısı verilmiş.
-A şıkkı: Graphta, verilen iki node arası path varsa true yoksa false döndürün. 15p
-B şıkkı: verilen iki graph eşitse true değilse false döndürün. 20p

2021-midterm
```

What are the differences between an expression and an assignment? Why do we need ore when we have the
Explain why applicative order evaluation is not used when side effects are allowed in an expression or functior

what type of errors do occur in the shift reduce parser ? How do we resolve them ?

Construct a DFA accepting a number in hexadecimal format with an even number of digits. Examples of such numbers include OxFF11, 0x11, OX4a4F00. Ox1122LAFFDD. Negative examples include 00x123abc, 0xFF110. 10ptsl
show the parse tree of this CFG for input (+ (- x y) (*12 4)). [5pts)

Construct a Left Regular CFG that accepts an expression in a dialect cf LISP.
This LISP dialect uses the following operators: +, -,* , / , ^.
The arguments of these operators could be an INT, DBL and ID where INT is a token indicating integer literal, DBL is a token indicating a real number. and ıd indicating token for identifier
+ operator accepts two or more parameters. e.g., (+1 4 5 x}.
-operator accepts one or two operatafr. e.g., (- 3 2),
*operator accepts two Of more operators e.g., (*x y 1 2).
/ and ^ operators accept exactly two operators,'. (/ 4 2).
Show your CFG in BNF indicating all necessary components, IISptsJ
for c and java , what type of typing system do these languages employ? Explain these typing systems . What ar

what are the variable binding ? What are the static and dynamic binding ? Compare static and dynamic binding of variables with respect to readibility and writability ?
provide an attribute grammar to calculate the values of expressions. Show above parse tree with these attribu

what is the partial function ? Why do we programs define partial functions
show a left regular grammar (with at least two BNF rules including two or more non terminal symbols)Explain

2017 vize
1. Left regular gramerlerin hangi formda olduğunu anlatıp örnekleme (3pts)
2. Statement ve expression arasındaki fark nedir (3pts)
3. Programlar neden parçalı fonksiyon tanımlar? (3pts)
4. Lisp gramer için BNF:
Operators : *, +, -, /, ^
+ 2 ya da daha fazla parametre alır
- 1 ya da 2 parametre alır
* 2 ya da daha fazla parametre alır
/, ^ yalnızca 2 parametre alır
(15 pts)
5. Binding nedir ? Static vs dynamic binding
6. C ve Java'nın tip sistemlerini karşılaştırın. (10 pts)
(strongly or weakly typing olarak soruyordu)
7. Hexadecimal sayıları gösterebilmek için bir DFA tanımlamamızı istiyordu. (7 pts)
8. Hexadecimal çift basamaklı sayıları gösterebilmek için de bir DFA istiyordu. (8 pts)
CLOJURE SORULARI
1. Parametre olarak liste alan bir fonksiyon yazın. İç içe listeler olabilir. Bu listeyi ters çevirip(reverse) return et
2. Listedeki bir elemanın kaç kere tekrar ettiğinizi bulan bir program yazın. İç içe listeler olabilir. Ex: (1, (3, 5), (3
3. Verilen string polindrome mudur bulan bir kod. Ex: (12321) (15pts)

2017 Final

1. Yeni bir dilin özelliklerini tanımlamıştı. Variable, number, expression, function nasıl tanımlanır tanımlamadak

Bu dilde number oluşturmayı gösteren dfa'yı çizmemizi istemişti. Sayılar integer // integer şeklinde oluyordu, l
Bu dil için BNF tanımlamamızı istiyordu. Terminal semboller <expr_func> şeklinde küçük harflerle, non-termina
Bu dilde yazılan biraz karmaşık bir expression için parse tree çizmemizi istiyordu.
2. Sözel sorulardı.
- type inferrence ve type checking in farkı nedir?
-
-
- C++ adt yi nasıl sağlar ve bunun module'den farkı nedir?
- C++ ve Java arasındaki farklar nelerdir? (Derste bahsettiği view varmış user view falan galiba o şekilde değerle
3. Prolog sorusu. Even_between(1,6,x) sorgusu, (2,4,6) döndürmeliydi. Even_number sorgusu yazmamızı istiyo
Bu kod için unification ve resolution'ı adım adım göstermemizi istemişti.
4. Clojure sorusu. Sonsuz basamaklı olacak, string şeklinde verilecek sayılarımız vardı. Bunlar için bir kütüphane
Add_int, add_float, sub_int, sub_float, mult_int, mult_float, … , sort, less than şeklinde fonksiyonları verip nele
Bazı fonksiyonları bazılarını kullanmadan yazmamızı istemişti… Örneğin mult_int implement ederken add_int k

2016 final - galiba

Given two lists produce a list of pairs obtained from the original list. Assume that the entnes of the lists are positive integers. If the number of entries does not match. use -1 as the
corresponding pair. E.g. (pairup '(1 2 3 4) '(11 12 13 14 15)) would return ((1 11) (2 12)(3 13)(4 14)
14) (-1 15)).
(defun pairup (x y)

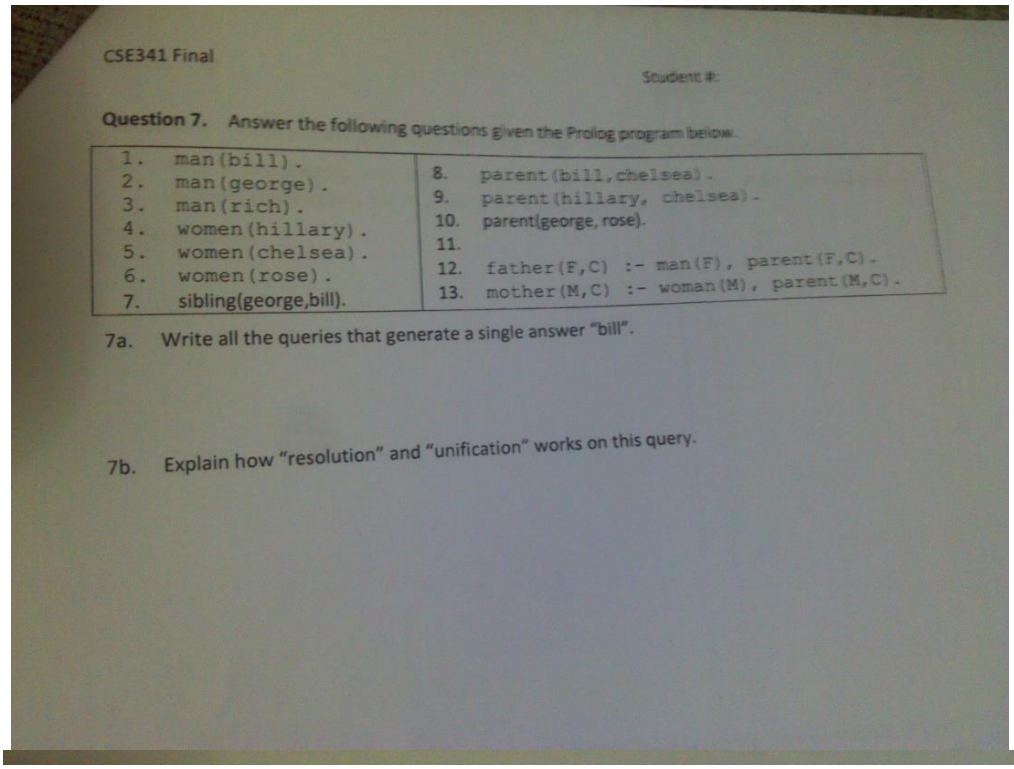
8a. Given a list, produce a list that is composed of the original list but every two consecutive
elements are swapped. E.g., (swap2 '(1 2 3 4 S)) would return (2 1 4 3 5). (defun swap2(x)
How can show if given CFG is ambigious
Explain explicit heap-dynamjc variables.
How iS cartesian products relevant in types?
What are discriminated unions?
What is the main differences between an expression and statement a Give example
What is expection binding?
What is type checking? What are the two checking mechanisms you Know?
What is type inference?
why does c have seperate compilation
what is the difference between a macro and call by reference
what are the name spaces
what are class variables and methods ? Provide examples
How are interfaces realized in C++
what is the difference between a class and object in smalltalk
what are object/instance methods and variables ? Provide examples
- OOP differences between prototype based and class-based

in prototype based feature of inheritance implemented via cloning.
it2s maybe a quicker way to turn around.

- differences between expression and statements
- Bir dil yazılması istenmişti. Dil için gerekli bilgiler verilmiş, bunların DFA, BNF formları istenmişti. Ayrıca Attribute-Grammer
  -- Dile göre verilen bir matematiksel ifadenin parse tree sinin çizilmesi istenmişti. Her şey bizim tasarlanmamız beklenmişti

- Lisp: Fraction sayılar için +,-,*,/ fonksiyonlarının yazılması
- Lisp: 2 tane listenin ortak elemanlarını döndüren fonksiyon
- axiomatic spesification sorusu vardı. Ders slaytlarında örneği var. Bir yapı için syntactic, semantic spec. yazılması istenmiş

- dynamic lookup neden daha iyidir?



CSE341 Final

Student #:

Question 7. Answer the following questions given the Prolog program below.

```
1.  man(bill).
2.  man(george).
3.  man(rich).
4.  women(hillary).
5.  women(chelsea).
6.  women(rose).
7.  sibling(george,bill).
8.  parent(bill,chelsea).
9.  parent(hillary, chelsea).
10. parent(george, rose).
11.
12. father(F,C) :- man(F), parent(F,C).
13. mother(M,C) :- woman(M), parent(M,C).
```

7a. Write all the queries that generate a single answer "bill".

7b. Explain how "resolution" and "unification" works on this query.

6b. Show the complete referencing environment after line #12 is executed when **test(x, x+y+n)** is called at line #16. Assume that call by name and dynamic scoping is used.

CSE341 Final

Student #:

Question 6. Answer the following questions using the code segment below.

```
1.  int n = 2;

2.  print_plus_n(int a) {
3.    println(a + n);
4.  }

5.  increment_n() {
6.    n = n + 1;
7.  }

8.  test(int b, int c) {
9.    int y = b + 2;
10.   print_plus_n(c);
11.   n = 200;
12.   increment_n();
13. }

14. main() {
15.   int x = 11, y = 12, n = 3;
16.   test(…); // see questions
17. }
```

6a. Show the complete referencing environment after line #12 is executed when **test(x, n)** is called at line #16. Assume that call by reference and static scoping is used.

CSE341 Final

Student #:

Question 2. Answer the following questions given the CFG below.

S → W N
W → C W | C
C → a | b | c | … | z
N → N D | D
D → 0 | 1 | 2 | … | 9

2a. Is this grammar left-regular or right-regular? Explain you answer.

2b. Make this grammar right-regular (if it is not already so). Write your answer on the left column.

2c. Using your answer to question 2b, show a parse tree for the input string "abc123".

What an expression?
What are eager and lazzy evaluations?
When would lazzy evaluation be useful?
What IS a "lambda expression"? What it used for?
Compare and contrast Java and Lisp for their expression evaluation strategies.

Dynamic lookup is an important concept in OOP languages. Compare and contrast and C++ in terms Of their lookup strategies. your evaluation should cover classes. objects and class and object methods and variables.

Assume that you have a programming language that does type inference. How would inference work for the ADT above?

How would you implement such an ADT in C++? Describe the data representation as well as other implementation details.

Write the second part of the specification for the data type described above. use the convention we described in class.

HOW can we specify an ADT (cons.der two main components for the specification) ?

Write the first part of the for the specification for the data typed described above . Use convention we described in class.
show the parse tree for the input string 123abc
show an LR derivation for the input abc123
show an RR derivation for the input string abc123

```
1. Implement Sudoku in  prolog (sudoku solution)(25P)  ------------- 2018 büt
2. Clojure: Add, sub, mult, lth(less than), sort, count(also count inner lists) operations on two list
        (addlist [list1 list2] ...some magic here...)
        (sublist [list1 list2] ...some magic here...)
        (multlist [list1 list2] ...some magic here...)

        Output:(1,0,0) + (1,0) = (1,1,0)

3. CFG question which was have 6-7 rules. (20P)

        Is it valid according to CFG?

                (2 3 x) 5 +

4. DFA Question. (15P)

        a. Is aabc substring available in (a,b,c,d)
        b. If one letter repeat even numbers, draw a dfa which accept this strings.
                aabbcc, aaaabbcc

5. Parse tree. There was some rules. You have to implement parse tree. (10)
        a. Ex: ((2 3 x)(5 2 +) +).   Draw parse tree of this statement
```

b. This part related with 3rd question. Find missing part of 3rd question and implement parse t

Question 1: Answer the following short questions.
1.1. Why do programs define partial functions?
Because functions domain cannot be expressed exactly by the typing system.
1.2. What are the four major programming paradigms?
They are imperative/procedural, functional/applicative, logic, and object oriented.
1.3. What does DFA stand for and what components does it have?
DFA stands for deterministic finite automaton. A DFA has a unique start state and one or more final (accepting) states.
1.4. What does a configuration in a DFA represent?
A configuration in a DFA represents a state and the remaining input.
1.5. What form do all production rules in a left regular grammar have? Explain the symbols you might use to answer this question.
All production rules in a left regular grammar has the form “A -> w” or “A ->B w”
where “A” is a non-terminal and “w” is a terminal symbol.

1.6. What do two Ls in LL parsing stand for? Explain what you mean.

The first “L” in LL parsing stands for left to right scan of the input and the second “L” means that leftmost derivation is generated.
1.7. How is “dangling else” ambiguity resolved in C/C++.

By associating each else with the closest if or by using {}.
Question 1: Answer the following short questions.
1.8. What are attribute grammars?
Attribute grammars are augmented CFGs where each grammar symbol has an associated set of attributes.
1.9. What is the referencing environment of a statement?
Referencing environment of a statement is all the names that are visible in the statement.
1.10. What is a discriminated union? What other two names does it have?
A discriminated union is a union with a discriminant. It is also called free unions, disjoint unions or variant type.
1.11. How is a type system defined? (Hint: It has two parts).
A type system is defined by type constructors and type checking.
1.12. Please fill in the blank: Haskell is a _____ typed language.

1.13. What are the two basic kinds of expressions in Scheme?
Atoms and lists.

1.14. What is programming in a “purely functional style”?

Programming without side effects.

1.15. What is the evaluation rule for lists in Scheme programming language?
Recursively evaluate the elements.

Give a context free grammar for the language { ai
bj
ck | i=k, i,j,k >= 0 }?

Show the parse tree for the input string “aabbbcc”?S a S c
a a S c c
a a B b c c
a a B b b c c
a a B b b b c c
a a b b b c c <S> o <B> | a <S> c<B> o <B> b | “”

Show that the following CFG is ambiguous? Note that <.> represents a non-terminal symbol while all others represents terminals. Use the input string “a+a*a” in your answer.
<S> o <S> + <S> | <S> * <S> | (<S>) | a
We show two distinct derivations for the input string. Either by direct derivation or parse tree.

Consider the following code segment on the left below. Answer the questions on the right. What would test() print if static scoping is used?
8 6 50
What would it print if dynamic scoping is used?

207 104 52
Question 5: Consider the following code segment on the left below. Answer the questions on the right.

```
int n = 1;
print_plus_n(int x) {
cout << x + n;
}
increment_n() {
n = n + 2;
print_plus_n(n);
}
test() {
int n;
n = 200;
print_plus_n(7);
n = 50;
increment_n();
cout << n;
}
```

ee list olarak, right tree list olarak. Search fonksiyonu, insert fonksiyonu ve remove fonksiyonu yazın. Lo

what form all product rules in a left regular grammer should have . Explain the symbols you might use t

eading bir 0 olamıyordu, “//” ifadesinden sonra whitespace gelemiyordu. (1//3 , 11//51 gibi)

like this. You can only user standart list operations and +,-,* arithmetic operations.(20P)

op kullanmak, mapping kullanmak yasak. Basic operationlar kullanılabilir.