United International University (UIU)

Dept. of Computer Science & Engineering (CSE)

Final Exam Spring 2023

CSE 4611/CSI 411: Compiler Design/Compiler

Total Marks: **40** Duration: 2 hours

Answer all questions. Figures are in the right-hand margin indicates full marks.

Any examinee found adopting unfair means will be expelled from the trimester / program as per UIU disciplinary rules.

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1. Read the following code and detect different types of errors. [8]

```
1.  #include <studio.h>
2.  double commite (floar april){
3.   float b=5;
4.   int b, c;
5.   b = summation(int c,,float aprjl) {
6.   retum 1;
7.   }
8.  void summation(int b){
9.  Float k == b*2;
10. retun b:
11.  }

12.  int main(){
13.  int b=2,a=2,
14.  float c;
15. if(B==2)
16. c = commitee(50);
17. a = c+2;
18. return 0;
19. }
```

2. (a) Generate Predictive Parsing Table for the following grammar with FIRST and FOLLOW sets. Consider all the terminals are of single character/number/symbol. [4+4]

$X \rightarrow YZ \mid abc \mid bZ$

$Z \rightarrow +YWa \mid abYa \mid b$

$Y \rightarrow RWa \mid bY \mid c \mid \in$

$W \rightarrow Rc \mid baZW \mid b \mid a$

$R \rightarrow c \mid [X] \mid *WZ \mid \in$

(b) Construct a Non-recursive Predictive Parsing table for the following grammar; also check whether string id + (id *id) is accepted or not. The sequence of Moves by Predictive Parser in a table (should have column: stack,input, action).

$E \rightarrow E + E \mid (E) \mid A$
$A \rightarrow A * A \mid AB \mid \in$
$B \rightarrow id \mid \in$

3. For the following grammars, write down the FIRST and FOLLOW sets for each nonterminal. [4+4]
Consider all the terminals are of single character/number/symbol.

(a)
$S \rightarrow AuStrALia \mid dHaKA$
$A \rightarrow CanAdA \mid LoKDoH \mid \in$
$L \rightarrow SDiLanKa \mid iKaC \mid \in$
$H \rightarrow AfriCa \mid uSA \mid \in$
$K \rightarrow LfHAiu \mid xASiu$
$D \rightarrow KiutLAi \mid pLKig$
$C \rightarrow LfHAiu \mid xASiu$

(b)
$S \rightarrow ACB \mid CbB \mid Ba$
$A \rightarrow da \mid BC$
$B \rightarrow BB \mid g \mid \in$
$C \rightarrow DB \mid h \mid \in$
$D \rightarrow 1 \mid 2 \mid 3 \mid \in$

4. Eliminate immediate left recursion from the following grammar. [4+4]

(a)
$X \rightarrow xa \mid +Xai \mid YBC \mid X + 2 \mid [x - 2] \mid Xikl$
$Y \rightarrow YYaB \mid iEhb \mid Yap(g) \mid abc \mid YaE \mid CE$
$A \rightarrow 0A(0) \mid AB02 \mid 2 * 3A \mid A[i * 2] \mid (A + 2)$
$B \rightarrow B \mid E\ ig \mid Dxy \mid BCy \mid ByC \mid xyB \mid BC$

b)
$I \rightarrow I + Z \mid I + X \mid I * Y + Z \mid /IY$
$J \rightarrow Jli \mid Kl * 2 \mid j/Z \mid J + 2[3]$
$Z \rightarrow (Z) \mid Z + (X * Y) \mid Z + 23$
$F \rightarrow 23 \mid Ftu \mid Y[F] \mid F(XYZ)$

5. Left Factor the following. [4+4]

(a) Consider each word as a single terminal.

P → Birds are beautiful| Birds Sings the Song | Birds Singing sounds nice | Flowers | flowers looks nice | flowers lovely | flowers lovers | Birds are small | Birpt | Bird flies

(b) Consider all the terminals are of single character/number/symbol.

A → 123456 | 121415 | 1134214 | 112256 | 323456 | 321156 | 32155 | 3234156
B → g+h | g+(y) | g - ((x+y))+2 | (p+q)*(a-b) | (u-v)-2 | g-x | (u+y) | (p+x) | (p+q)/24 | (u + gh)