

# 2202-COL226 Minor1

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TOTAL POINTS

23 / 40

QUESTION 1

Q1 8 pts

1.1 Q1 (a) 4 / 4

! + 4 pts *regular expression specifies exactly  $A^+$*

ff + 2 pts minor errors (regular expression specifies  $A^*$ )

ff + 0 pts Incorrect/Unattempted

1.2 Q1 (b) 4 / 4

! + 4 pts *DFA recognizes exactly  $A^+$*

ff + 2 pts minor errors (DFA recognizes  $A^*$ /NFA recognizing  $A^+$ )

ff + 0 pts Incorrect/Unattempted

QUESTION 2

2 Q2 9 / 10

(a) Unambiguous CFG design

! + 5 pts *(a) Correct unambiguous grammar (with only left-linear and right-linear productions)*

ff + 4 pts Correct unambiguous grammar with one rule of the form  $N \rightarrow xy$ ,  $N \in \mathcal{N}$ ,  $x, y \in \mathcal{T}$ , and other rules being left-linear/right-linear

ff + 2 pts CFG recognizes  $\{a^nb^n \mid n \geq 0\}$  and is left-linear/right-linear

ff + 0 pts (a) Correct grammar but not left-linear/right-linear

ff + 0 pts (a) Grammar does not recognize

$\{a^nb^n \mid n > 0\}$  / Grammar is ambiguous

/ Not Attempted

(b) Proof of unambiguity

ff + 5 pts (b) All correct

! + 1 pts *(b) Correct Induction Variable*

ff + 1 pts (b) Correct Base Case

! + 1 pts *(b) Correct IH*

! + 2 pts *(b) Correct invocation of IH*

ff + 0 pts (b) Incorrect / Not Attempted

The base case is string "ab" here not "aSb".

QUESTION 3

3 Q3 2 / 7

ff + 7 pts Correct CFG and justification of  $L = L(G)$

ff + 5 pts Correct CFG but justification of  $L = L(G)$  missing/incorrect

! + 1 pts *CFG generates superset of  $\{a^mb^n \mid m, n \geq 0, m \neq n\}$*

! + 1 pts *A language  $L$  is said to be a context-free language (CFL), if there exists a CFG  $G$ , such that  $L = L(G)$*

ff + 0 pts CFG does not generate  $\{a^mb^n \mid m, n \geq 0, m \neq n\}$

ff + 0 pts Incorrect/Not attempted/No CFG defined

Check ab

QUESTION 4

4 Q4 4 / 15

EBNF

- ☒ - 0 pts Correct
- ☒ - 2 pts Incorrect precedence order of operators
- ☒ - 2 pts Incorrect associativity of operators
- ! - 1 pts *Minor errors in EBNF specification*
- ☒ - 5 pts Incorrect / Not attempted

CFG

- ☒ - 0 pts Correct
- ☒ - 3 pts Simply converted EBNF to CFG without removing left recursion.
- ☒ - 1 pts Minor errors in CFG specification
- ! - 5 pts *Incorrect / Not attempted*

FIRST and FOLLOW sets

- ☒ - 0 pts Correct
- ☒ - 1 pts Incorrect FIRST of start symbol
- ☒ - 1 pts Incorrect FOLLOW of start symbol
- ☒ - 1.5 pts Incorrect FIRST of other non-terminals
- ☒ - 1.5 pts Incorrect FOLLOW of other non-terminals
- ! - 5 pts *Incorrect / Not attempted*

☒ ☒ ☒ 1 + 2 cannot be generated. Further EBNF specification was required.

















