MATH 280 Discrete Mathematical Structures Assignment #11 Name ____________

The point values for each question is given within []. The total number of points for this assignment is 40.

[2] 1. Consider the monoid $(\mathbb{Z}, +)$. Compute $\langle\{5\}\rangle$, the submonoid generated by the set $\{5\}$.

[4] 2. Consider the grammar $\langle T, N, S, P\rangle$, where $T = \{+, *, (,), n\}$, $N = \{S\}$, $S = S$, and P is defined by

$$S \rightarrow S+S \mid S*S \mid (S) \mid n$$

Provide parse trees for the following strings:

(a) $n*(n+n)$

(b) $n*n+n$

[4] 3. Consider the grammar $\langle T, N, S, P\rangle$, where $T = \{+, *, (,), n\}$, $N = \{E, T, F\}$, $S = E$, and P is defined by

$$\begin{array}{lcl} E & \rightarrow & E+T \mid T \\ T & \rightarrow & T*F \mid F \\ F & \rightarrow & (E) \mid n \end{array}$$

Provide parse trees for the following strings:

(a) $n*(n+n)$

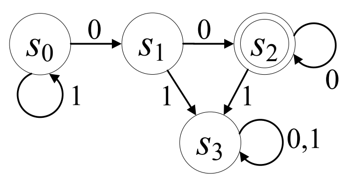
(b) $n*n+n$

[5] 4. Consider the set of all bitstrings that begin and end with a 1.

(a) Provide a grammar for the language.

(b) Use your grammar to produce a parse tree for the string 10101

[3] 5. Give a regular expression for the set recognized by the following finite automaton:



[6] 6. Give a regular expression for set of bitstrings

(a) containing an even number of 0s

(b) that begin with a 0 and end with 010

[3] 7. Provide a finite automaton that recognizes the set of bitstrings that begin with a 0 and end with 010.

[5] 8. Find a context-free grammar that generates the language $L = \{ss^R \mid s \in \{0,1\}^*$ and s^R is the reverse of string $s\}$.

[8] 9. Consider the regular expresson $(1^*0(01)^*)|(00^*)$.

(a) Provide a context-free grammar $G = \langle T, N, S, P\rangle$ for strings represented by the regular expression.

(b) Given your G, draw a parse tree for 00000000.

(c) Given your G, draw a parse tree for 00101.

(d) Given your G, draw a parse tree for 1110.