جامعة دمياط
Damietta University
جامعة دمياط
كلية العلوم
قسم الرياضيات

نموذج امتحان نهائي
الفصل الدراسي الثاني للعام الجامعي
2023/2022

المستوى: الثاني ساعات معتمدة
البرنامج : علوم الحاسب
المادة: نظرية الأليات الذاتية
الكود: (208س)
التاريخ: 17 / 6 /2023 (السبت)
الزمن: ساعتان
الدرجة الكلية: 105 درجة

Answer the following questions:

Question 1: **(55 Degree)**

1. **Define the following:** CFG, CNF, BNF, PDA **(10 Degree)**
2. Compare **Ambiguous** and **Unambiguous Grammar.** **(5 Degree)**
3. **Are the following statements true or false? Explain your answer in each case. (In each case, a fixed alphabet Σ is assumed.)** **(40 Degree)**
   - **a.** Regular languages are not closed under infinite union.
   - **b.** Every finite subset of a non-regular language is regular.
   - **c.** If L is CFL, then $\bar{L}$ is also a CFL.
   - **d.** The language $L = \{a^n b a^n : n \geq 0\}$ is a regular language.
   - **e.** If L_1 and L_2 are CFL, then $L_1 \cup L_2$ is not a CFL.
   - **f.** If L is regular language, then L^* is also a regular language.
   - **g.** If L is a regular, then $L' = \{xy : x \in L \text{ and } y \notin L\}$ is a regular language.
   - **h.** Consider the production rules of grammar G is

     $$S \to AbB, A \to aAb|\varepsilon, \mathrm{B} \to \mathrm{bB}|\varepsilon.$$

     The language is generated by that grammar is $L = \{a^n b^m : n \geq 0, m \geq 0\}$.

Question 2: **(50 Degree)**

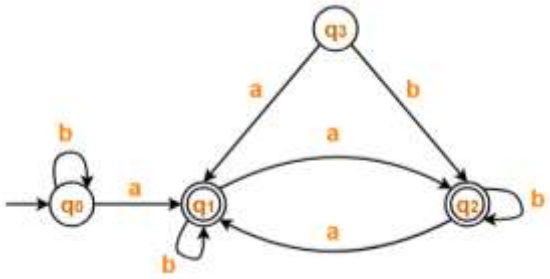
1. Write a CFG, which generates odd palindrome for binary numbers, then convert that grammar to a PDA. **(10 Degree)**
2. Consider the given grammar $G = (\{S, A, B\}, \{a, b\}, P, S)$, where

   $$P = \{S \to a \mid aA \mid B, \quad A \to aBB \mid \varepsilon, \quad B \to Aa \mid b\}.$$

   Convert the given CFG to CNF. **(10 Degree)**
3. Consider the given grammar $G = (\{E, I\}, \{a, b, c, +, *\}, P, E)$, where

   $$P = \{E \to E + E \mid E * E \mid I, \quad I \to a \mid b \mid c\}.$$

   a) Show that this grammar G is ambiguous for the string $a + b * c$.
   b) Construct an unambiguous grammar equivalent to G. **(10 Degree)**
4. Minimize the following DFA. **(10 Degree)**



5. Construct a PDA that accept the following language:

   $$L = \{a^i b^j c^k : \quad i, j, k \geq 0 \text{ and } i + j = k\}.$$ **(10 Degree)**

انتهت الأسئلة
مع أطيب التمنيات بالتوفيق

أستاذ المقرر: د / وفاء قوطه
رئيس قسم الرياضيات: أ.د/ أحمد محمد كامل طرابيه