Please check that this question paper contains 9 questions and 2 printed pages within first ten minutes.

[Total No. of Questions: 09] [Total No. of Pages: 2]

Uni. Roll No. …….

Program/ Course: B.Tech.
Semester: 5th / (2018)
Name of Subject: Theory of Computation
Subject Code: PCIT-112
Paper ID: 16443

15-01-2022(E)

Time Allowed: 02 Hours **Max. Marks: 60**

NOTE:

1) Each question is of 10 marks.
2) Attempt any six questions out of nine
3) Any missing data may be assumed appropriately

Q1. a) State Pumping Lemma for Regular language. Show that the set
$L = \{ a^i b^i \mid i >= 1\}$ is not regular.
b) State Pumping Lemma for Context Free Grammar. Show that the set
$L = \{ a^p \mid p \text{ is prime } \}$ is not CFL.

Q2. a) Convert the following Grammar into Greibach Normal Form (GNF):
S->XA | BB, B-> SB | b, X->b , A→a
b) Give the examples/applications designed as finite state system.

Q3. a) Construct a PDA that accepts $L = \{ ww^R \mid w = (a+b)^* \}$. What are the applications of automata theory?
b) State the equivalence of PDA and CFL.

Q4. a) Differentiate L* and L+
b) How many strings of length less than 4 contains the language described by the regular expression (x+y)*y(a+ab)*?

Q5. a) How to convert finite automata to regular expression by using Arden's theorem.
b) Suppose that language A_1 has a context-free grammar $G_1 = (V_1, \Sigma, R_1, S_1)$, and language A_2 has a context-free grammar $G_2 = (V_2, \Sigma, R_2, S_2)$, where, for i = 1, 2, V_i is the set of variables, R_i is the set of rules, and S_i is the start variable for CFG G_i. The CFGs have the same set of terminals Σ. Assume that $V_1 \cap V_2 = \varnothing$. Define another CFG $G_3 = (V_3, \Sigma, R_3, S_3)$ with $V_3 = V_1 \cup V_2 \cup \{S_3\}$, where $S_3 \in V_1 \cup V_2$, and $R_3 = R_1 \cup R_s \cup \{ S_3 \rightarrow S_1, S_3 \rightarrow S_2 \}$. Argue that G_3 generates the language $A_1 \cup A_2$. Thus, conclude that the class of context-free languages is closed under union.

Q6. Construct a Turing machine for $L = \{a^i b^j c^k \mid i*j = k; i, j, k \geq 1\}$. Discuss the Halting Problem in Theory of Computation.

Please check that this question paper contains 9 questions and 2 printed pages within first ten minutes.

Q7. List the Conversion from Mealy to Moore Machine. What is Є-closure of a state q0?

Q8. a) Write a regular expression to denote a language L which accepts all the strings which begin or end with either 00 or 11.

b) Construct Pushdown automata for L = $\{0^n1^m2^m3^n \mid m,n \geq 0\}$

Q9. a) Construct a regular expression for the language which accepts all strings with atleast two c's over the set Σ={c,b}

b) What is the minimum number of states in deterministic finite automata (DFA) for string starting with ba^2 and ending with 'a' over alphabet {a, b}?

****