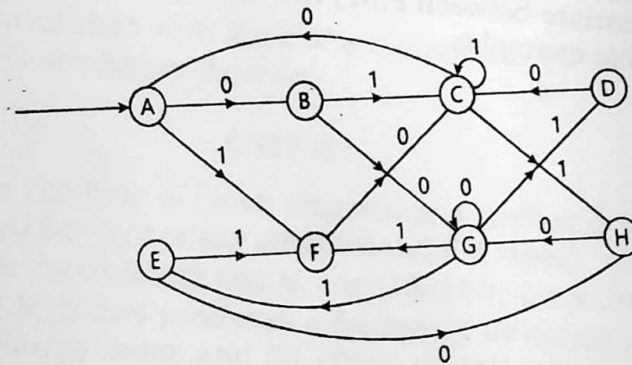


END TERM EXAMINATION**FIFTH SEMESTER [B.TECH] NOVEMBER-DECEMBER 2018****Paper Code: IT-301****Subject: Theory of Computation****Time: 3 Hours****Maximum Marks: 75****Note: Attempt any five questions including Q no.1 which is compulsory.**

- Q1
- Explain Chomsky's Hierarchy. (2.5)
 - Explain Halting Problem. (2.5)
 - What are the differences between DFA and NFA? (2.5)
 - What is an ambiguous grammar? Give an example of such a grammar. (2.5)
 - Is Non deterministic push down automata more powerful than non deterministic push down automata? Justify. (2.5)
 - What is the full form of Class P and class NP? What is the relation between these two? (2.5)
 - What do you mean by LL(k) grammar? Give example of such a grammar. (2.5)
 - What do you understand by the statement, "Problem P is reducible to problem Q". Explain the term Reducibility. (2.5)
 - What is an alphabet? Give an example of an alphabet and also an example of a set which is not an alphabet. (2.5)
 - Define Kleen closure. What is Kleen closure of an empty set? (2.5)
- Q2
- Define a regular expression. Also write the regular expressions for the following languages. (6)
 - The set of all strings ending in the substring '00' on $\Sigma = \{0, 1\}$.
 - $L = \{a^n b^m \mid n \geq 4, m \leq 3\}$.
 - Consider the DFA given by the transition diagram: (6.5)



Draw the table of distinguishabilities for this automation. Construct the minimum state equivalent DFA.

- Q3
- State and prove pumping lemma for regular languages. Show that the language $L = \{a^n b^n \mid n \geq 0\}$ is not regular. (6)
 - Prove that every language defined by a regular expression is also defined by a finite automaton. (6.5)

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- Q4 (a) Design a PDA for the language $= \{\omega\omega^R \mid \omega \in \{a, b\}^*\}$. Draw the transition diagram and also write the sequence of ID's for the string 'abba'. (6)
 (b) What is an unit production? Begin with the grammar: $S \rightarrow ABC \mid BaB$
 $A \rightarrow aA \mid BaC \mid aaa$
 $B \rightarrow bBb \mid a \mid D$
 $D \rightarrow \epsilon$
 Eliminate ϵ - productions
 Eliminate any unit production in the resulting grammar
 Eliminate any useless symbol in the resulting grammar. (6.5)
- Q5 (a) Define CNF and convert the following grammar into CNF. (6)
 $S \rightarrow Aba$
 $A \rightarrow aab$
 $B \rightarrow Ac$
 (b) Prove that the family of context-free languages is closed under union, concatenation and star-closure. (6.5)
- Q6 Design a turning machine to accept the set of all palindromes over $\{0, 1\}$. Also, indicate the moves made by Turing machine for the string. (12.5)
- Q7 Write short notes on following:- (6.25x2=12.5)
 (a) Post Correspondence Problem.
 (b) Multitape turing machine
- Q8 (a) Differentiate between Recursive and Recursively enumerable languages (6.5)
 (b) Differentiate between P, NP, NP hard and NP complete problems using suitable examples. (6)
