END TERM EXAMINATION

FIFTH SEMESTER [B.TECH.] DECEMBER 2017

Paper Code: IT-301	Subject: Theory of Computation
Time: 3 Hours	Maximum Marks: 60

Note: Attempt any five questions including Q.No 1 which is compulsory. Select one question from each unit.

Q1 Answer the following questions: (2x10=20)
   (a) State kleen's theorem. what is a regular expression.
   (b) Define top down parsing and LL(1) grammar.
   (c) Write your comment on "Can a machine produce itself?
   (d) Define PSPACE and NSPACE complexity claases.
   (e) Prove that langiage $L=\{a^n b^n | n>0\}$ is not regular.
   (f) State Punping lemma for context free language.
   (g) What is a parse tree
   (h) Differentiate between polynomial time reduction and Logarithmic space reduction
   (i) Define Pushdown automata. Give example.

UNIT-I

Q2 Prove that regular languages are closed under union and intersection. Let M1 and M2 be the two Finite automata's accepting the language L1 and L2 respectively. Design automaton to recognize the language.   (10)
   (a) $L_1 \cup L_2$
   (b) $L_1 - L_2$
   (c) $L_1 \cap L_2$
      Where L1=(No. of a's in the string defined over a, b is even}
      And L2={ no of b's in the string defined over over a,b is odd}

Q3 Define Nondeterministic automata. Explain the mechanism to convert NDFA into DFA.   (10)

UNIT-II

Q4 Define Pushdown automata. What is instantaneous descriptor. Design a pushdown automata to recognize the language $L=\{a^n b2^n | n>1\}$ (10)

Q5 Prove that context free languages are closed under union and concatenation. Also prove that intersection of a Context free language and regular language will be a context free language.   (10)

UNIT-III

Q6 What is Un-decidability problem? Prove that Halting Problem is Un-decidable.   (10)

Q7 Prove that Multitape Mutlihead Turing is computationally equivalent to a Standard Turning Machine. Design a turning Machine to accept the language $L=\{a^n b^n | n>0\}$.   (10)

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UNIT-IV

Q8 Write your views on the following "Every P-class problem is an NP-class problem". Also Prove that clique problem is NP complete. (10)

Q9 Prove that a problem solvable in the space of $O(f(n))$ requires worst case time of the order of $O(2^{f(n)})$ [Make necessary assumptions]. State and Prove Savich theorem. (10)

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END TERM EXAMINATION

FIFTH SEMESTER [B.TECH.] DECEMBER 2017

Paper Code: IT-301

Time: 3 Hours

Subject: Theory of Computation

Maximum Marks: 75

Note: Attempt any five questions including Q.No 1 which is compulsory. Select one question from each unit.

Q1 Answer the following questions: (2.5x10=25)
- (a) State kleen's theorem. what is a regular expression.
- (b) Define top down parsing and LL(1) grammar.
- (c) Write your comment on "Can a machine produce itself?
- (d) Define PSPACE and NSPACE complexity claases.
- (e) Prove that langiage $L=\{a^n b^n | n > 0\}$ is not regular.
- (f) State Punping lemma for context free language.
- (g) What is a parse tree
- (h) Differentiate between polynomial time reduction and Logarithmic space reduction
- (i) Define Pushdown automata. Give example.

UNIT-I

Q2 Prove that regular languages are closed under union and intersection. Let M1 and M2 be the two Finite automata's accepting the language L1 and L2 respectively. Design automaton to recognize the language. (12.5)
- (a) $L_1 \cup L_2$
- (b) $L_1 - L_2$
- (c) $L_1 \cap L_2$

   Where L1=(No. of a's in the string defined over a, b is even}
   And L2={ no of b's in the string defined over over a,b is odd}

Q3 Define Nondeterministic automata. Explain the mechanism to convert NDFA into DFA. (12.5)

UNIT-II

Q4 Define Pushdown automata. What is instantaneous descriptor. Design a pushdown automata to recognize the language $L=\{a^n b^{2n} | n > 1\}$ (12.5)

Q5 Prove that context free languages are closed under union and concatenation. Also prove that intersection of a Context free language and regular language will be a context free language. (12.5)

UNIT-III

Q6 What is Un-decidability problem? Prove that Halting Problem is Un-decidable. (12.5)

Q7 Prove that Multitape Mutlihead Turing is computationally equivalent to a Standard Turning Machine. Design a turning Machine to accept the language $L=\{a^n b^n | n > 0\}$. (12.5)

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UNIT-IV

Q8 Write your views on the following "Every P-class problem is an NP-class problem". Also Prove that clique problem is NP complete.

(12.5)

Q9 Prove that a problem solvable in the space of $O(f(n))$ requires worst case time of the order of $O(2^{f(n)}$ [Make necessary assumptions]. State and Prove Savich theorem.

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(12.5)

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