Question Paper Code : X 20402

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Fifth/Eighth Semester
Computer Science and Engineering
CS6503 – THEORY OF COMPUTATION
(Common to : Information Technology)
(Regulations 2013)

Time : Three Hours   Maximum : 100 Marks

Answer ALL questions

PART – A   (10×2=20 Marks)

1. Find the set of strings accepted by the finite automata.

2. Prove that $L = \{a_i b_i \mid i \geq 0\}$ is not regular.

3. Difference between regular expression and regular language.

4. Consider the following grammar G with productions.
   $S \rightarrow aaSb$
   $S \rightarrow \lambda$

5. State the pumping lemma for CFLs.

6. Design a DFA to accept the language. L = {w/w is of even length and begins with 01}.

7. Define Turing machine.

8. What is Halting problem ?

9. How to prove that the post correspondence problem is undecidable ?

10. Differentiate NP-hard and NP-completeness problem.

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PART – B   (5×13=65 Marks)

11. a) Convert the following NFA into DFA.   (13)

a, b

q₀   a   q₁   b   q₂
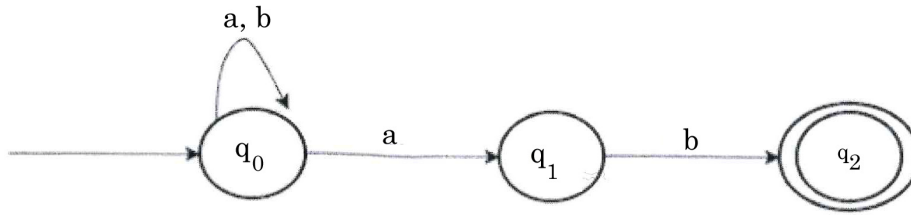
Following are the various parameters for NFA
$Q = \{q_0, q_1, q_2\}$
$\Sigma = (a, b)$
$F = \{q_2\}$
δ (Transition Function of NFA)

(OR)

b) i) Construct a minimized DFA from the regular expression :
(11)* + (111)*.   (8)
ii) Discuss the application of finite automata.   (5)

12. a) Is the following grammar is ambiguous ? Justify your answer.   (13)
$E \rightarrow E + E \mid id.$

(OR)

b) Convert Context Free Grammar (CFG) into Greibach Normal Form (GNF). (13)
$G1 = \{S \rightarrow aA \mid bB, B \rightarrow bB \mid b, A \rightarrow aA \mid a\}$
$G2 = \{S \rightarrow aA \mid bB, B \rightarrow bB \mid \varepsilon, A \rightarrow aA \mid \varepsilon\}$

13. a) Define the pushdown automata for language {anbn | n > 0}.   (13)

(OR)

b) Describe the Equivalence of pushdown automata and CFL.   (13)

14. a) Explain multi head and multi tape turing machines.   (13)

(OR)

b) i) Design a turing machine which reverses the given string {abb}.   (8)
ii) Describe the programming techniques for TM.   (5)

15. a) i) Write short notes on primitive recursive functions.   (8)
ii) Give an account on NP completeness.   (5)

(OR)

b) i) Explain the difference between tractable and intractable problems with examples.   (9)
ii) Give an example of undecidable problem.   (4)

PART – C   (1×15=15 Marks)

16. a) Obtain a Greibach Normal Form grammar equivalent to the Context Free
Grammar 0 | AA S → 1 | SS A →   (15)

(OR)

b) Construct the Turing machine for the language { } 1 | 0 1 ≥ = n L n n.   (15)

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