R15

Code No: 124AG

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, May - 2017
FORMAL LANGUAGES AND AUTOMATA THEORY
(Computer Science and Engineering)

Time: 3 Hours Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) Define Transition Table. [2]
b) Explain the difference between DFA and NFA. [3]
c) Construct CFG to generate strings with any number of 1's. [2]
d) Explain Leftmost Derivation with an example. [3]
e) Construct PDA for the language $L=\{a^m b^m c^n \mid m, n \geq 1\}$ [2]
f) Define Ambiguity in CFG with an example. [3]
g) Explain about Turing Machine. [2]
h) Write a short note on Recursive languages. [3]
i) List the properties of type-3 grammar. [2]
j) Define Context-sensitive grammar. [3]

PART-B

(50 Marks)

2.a) Construct NFA with ε which accepts a language consisting the strings of any number of 0's followed by any number of 1's followed by any number of 2's.
b) Check whether the following two FSM's are equivalent. [5+5]

M1	0	1
→ A	B	D
(B)	A	C
C	D	B
(D)	C	A

M2	0	1
→ P	R	R
Q	R	P
(R)	P	Q

OR

3.a) Define Moore and Mealy machines with examples.
b) Design FA to accept string with 'a' and 'b' such that the number of a's are divisible by 3. [5+5]

4.a) Construct the left linear grammar for the language (0+1)*00(0+1)*.
b) Apply pumping lemma for the language $L=\{a^n/n$ is prime$\}$ and prove that it is not regular. [5+5]

OR

5. Design a FA for the following Languages
   a) (0*1*)*
   b) (0+1)*111*
   c) (0*11*+101). [3+3+4]

6.a) Find the GNF equivalent to the following
   S → AA | a
   A → SS | b
   b) Convert the following grammar to a PDA that accepts the language by empty stack
   S→0S1|A
   A→1A0|S|ε. [5+5]

OR

7.a) Eliminate Useless symbols from the following grammar
   S → aA | a | Bb | cC
   A → aB
   B → a | Aa
   C → cCD
   D → ddd
   b) Construct CFG for the PDA M =($\{q_0,q_1\}$, $\{0,1\}$, $\{R,Z_0\}$, δ, q_0, Z_0, Φ) and δ is given by
   $\delta(q_0,1,Z_0)=(q_0,RZ_0)$
   $\delta(q_0,1,R)=(q_0,RR)$
   $\delta(q_0,0,R)=(q_1,R)$
   $\delta(q_1,0,Z_0)=(q_0,Z_0)$
   $\delta(q_0,\varepsilon,Z_0)=(q_0,\varepsilon)$
   $\delta(q_1,1,R)=(q_1,\varepsilon)$. [5+5]

8.a) Design a Turing Machine to accept $L=\{WW^R \mid W \text{ is in } (a+b)^*\}$.
   b) Design a TM to recognize the language $L=\{1^n2^n3^n \mid n \geq 1\}$. [5+5]

OR

9.a) Design TM which will recognize strings containing equal number of 0's and 1's.
   b) Design TM that accepts the language 00*. [5+5]

10.a) Explain Chomsky hierarchy of Languages.
   b) Write short note on NP- hard and NP-complete problem. [5+5]

OR

11.a) Discuss about universal turing Machine.
   b) Define post's correspondence problem and show that it is undecidable. [5+5]

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