Hall Ticket Number:

Code No. : 31125

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (CSE) III Year I-Semester Main & Backlog Examinations, December-2017

Automata, Languages and Computation

Time: **3** hours Max. Marks: **70**

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

1. Write a regular expression for the language over the alphabet $\sum$= {0, 1}. The set of all strings in which every pair of adjacent 0's appears before any pair of adjacent 1's.
2. Construct a DFA accepting the set of all strings beginning with 101, over the alphabet {0,1}.
3. If a language is satisfying Pumping lemma of regular sets. Can we conclude that the given language is regular? Justify.
4. Can we have more than one minimized Deterministic Finite Automata for a given language? Justify with an example.
5. Distinguish between DPDA and NDPDA.
6. Simplify the following grammar.
   S->AB
   A->a
   B->C
   B->b
   C->D
   D->E
7. What is multitape Turing Machine?
8. What is universal Turing Machine?
9. Differentiate classes P and NP.
10. Mention any two undecidable problems.

Part-B (5 × 10 = 50 Marks)

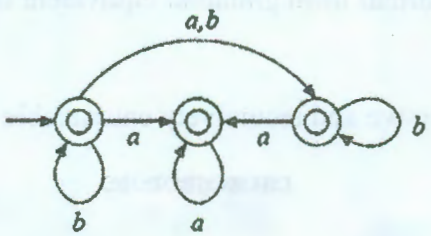
11. a) Convert the following NFA to DFA. [5]

	0	1
->p	{p, q}	{p}
q	-	{r}
*r	{p,r}	{q}

b) Consider the following NFA over $\sum$={a,b}, [5]

i) What is the shortest string not accepted by this NFA

ii) Name the states and Compute the epsilon closure of each state.



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12. a) Below Table-1 is the transition table of a DFA. Find the distinguishable states by filling out the table-2 above. However, place X's only for those pairs that are distinguishable by the basis step. For those discovered to be distinguishable during the induction, place numbers 1, 2, ... indicating the order in which you discovered these pairs to be distinguishable. Note that many different orders are correct. Also note: cells with # are not to be filled in. Which sets of states are mutually equivalent? Draw the transition table for the minimum-state equivalent DFA. [5]

	0	1
->A	E	B
*B	D	A
C	G	A
*D	G	E
E	A	D
F	B	E
*G	B	A

	G	F	E	D	C	B
A						
B						#
C					#	#
D				#	#	#
E			#	#	#	#
F		#	#	#	#	#

b) Show that the two grammars are equivalent. [5]

$S \rightarrow abAB \mid ba$
$A \rightarrow aaa$
$B \rightarrow aA \mid bb$

and

$S \rightarrow abAaA \mid abAbb \mid ba$
$A \rightarrow aaa$

13. a) Design a PDA to recognize the set of balanced strings of parentheses over the alphabet {(,)}. [5]

b) Convert the following CFG productions to CNF. [5]
S->bA | aB
A->bAA | aS | a
B-> bSbb | aBB

14. a) Give the formal definition of Turing machine. [2]

b) Design Turing machine to recognize the language L: {wcw^r|w is in $(0+1)^*$} [8]

15. a) Consider the following instance of Post's Correspondence Problem (PCP) with two lists A={1, 10111, 10} and B={111, 10, 0}. Find whether the given instances of PCP has solution or not? [6]

b) Briefly explain satisfiability problem. [4]

16. a) Give ε-NFA for $a^*b+b^*c+c^*a$ [5]

b) Give the CFG for the set of palindromes over {0, 1}. Draw the parse tree for deriving the string 01110. [5]

17. Answer any ***two*** of the following:

a) Show that the following is not Context Free language. [5]
{$a^ib^jc^k$|i<j<k}

b) Find a Greibach Normal form grammar equivalent to the following CFG: [5]
$S \rightarrow AA \mid 0$
$A \rightarrow SS \mid 1$

c) Explain about recursive and recursively enumerable languages. [5]