

JK LAKSHMIPAT UNIVERSITY, JAIPUR
INSTITUTE OF ENGINEERING AND TECHNOLOGY
End Term Examination (Regular), November 2017
B. Tech in Computer Science Engineering, Semester V

Subject Code: CSE 504

Roll No.....

Subject Name: Theory of computation

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
 2. Assume suitable data wherever required and mention it clearly.
 3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.
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Q.1A Objective type multiple choice questions (10 questions @ 1 mark) 10

- i. Which of the following is not a part of 5-tuple finite automata?
 - a) Input alphabet
 - b) Transition function
 - c) Initial State
 - d) Output Alphabet
- ii. All the regular languages can have one or more of the following descriptions:
 - i) DFA ii) NFA iii) e-NFA iv) Regular ExpressionsWhich of the following are correct?
 - a) i, ii, iv
 - b) i, ii, iii
 - c) i, iv
 - d) i, ii, iii, iv
- iii. Which of the following language regular?
 - a) $\{a^i b^j \mid i \geq 0\}$
 - b) $\{a^i b^j \mid 0 < i < 5\}$
 - c) $\{a^i b^j \mid i \geq 1\}$
 - d) None of the mentioned
- iv. Finite automata requires minimum _____ number of stacks.
 - a) 1
 - b) 0
 - c) 2
 - d) None of the mentioned
- v. The minimum Number of states require to accept string ends with 10.
 - a) 3
 - b) 2
 - c) 1
 - d) can't be represented.
- vi. Let $\Sigma = \{a, b, \dots, z\}$ and $A = \{\text{Hello, World}\}$, $B = \{\text{Input, Output}\}$, then $(A^* \cap B) \cup (B^* \cap A)$ can be represented as:
 - a) $\{\text{Hello, World, Input, Output, } \epsilon\}$
 - b) $\{\text{Hello, World, } \epsilon\}$

- c) {Input, Output, ϵ }
- d) {}
- vii. Halting states are of two types. They are:
 - a) Accept and Reject
 - b) Reject and Allow
 - c) Start and Reject
 - d) None of the mentioned
- viii. A turing machine with several tapes is known as:
 - a) Multi-tape turing machine
 - b) Poly-tape turing machine
 - c) Universal turing machine
 - d) All of the mentioned
- ix. A push down automaton employs _____ data structure.
 - a) Queue
 - b) Linked List
 - c) Hash Table
 - d) Stack.
- x. The instantaneous PDA has the following elements
 - a) State
 - b) Unconsumed input
 - c) Stack content
 - d) All of the mentioned

Q.2 Short answer type questions (4 questions @ 2.5 marks)

10

- i. What is a state and write about few types of states?
- ii. Explain Kleene's Theorem
- iii. Explain halting problem.
- iv. Explain different Variants of Turing Machine.

Q.3A Design a DFA to accept even number of a's and odd number of b's, where $\Sigma = \{a, b\}$. Show the acceptance of a string with an example.

05

Q.3B Minimize the following DFA, where state '0' is the start state and 3, 5, 6 & 7 are the final states.

05

	a	b
0	1	2
1	4	5
2	3	-
3	-	-
4	4	2
5	6	-
6	7	-
7	7	-

Q.4A Find whether the lists

05

$A = (abb, aa, aaa)$ and $B = (bba, aaa, aa)$

have a Post Correspondence Solution?.

Q.4B Explain Ambiguity in Grammar. 05

Q.5A Convert the following RA into its equivalent DFA : $1(0+1)^*0$. 05

Q.5B Construct a PDA that accepts $L = \{x^n y^n \mid n \geq 0\}$ 05

Q.6A Design a top-down parser for the expression " $x+y*z$ " for the grammar G with the following production rules – 05

P: $S \rightarrow S+X \mid X, X \rightarrow X*Y \mid Y, Y \rightarrow (S) \mid id.$

Q.6B Construct an NFA equivalent to the regular expression $1^*0+11011^*$ and $(0+1)^*$. 05

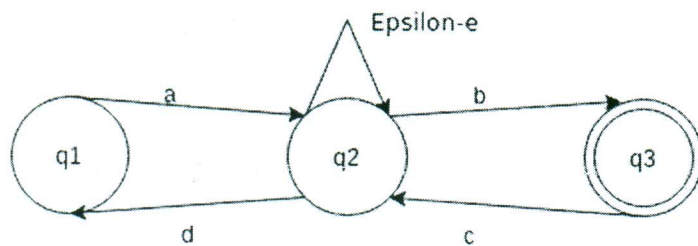
OR

Q.6B Simplify the given grammar: 05

$A \rightarrow a \mid aaA \mid abBc$

$B \rightarrow abba \mid b$

Q.7A Reduce the state diagram. 05



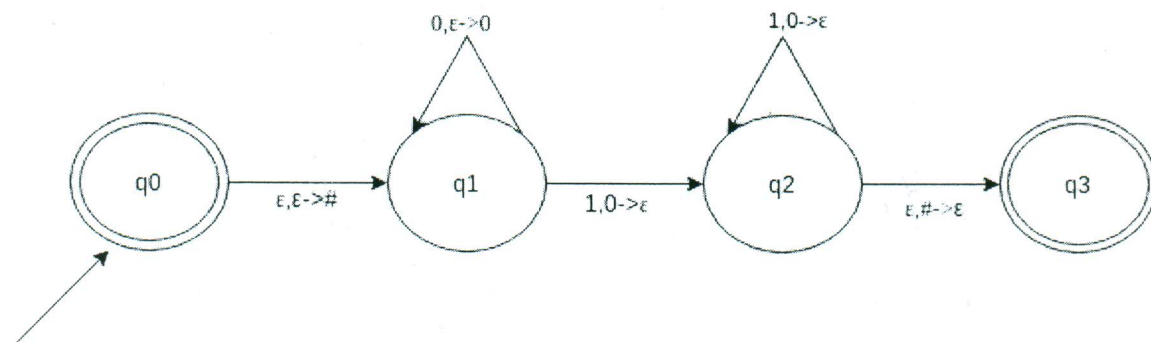
Q.7B Construct a CFG for the given Language: 05

$L = \{x \in \{0,1\}^* \mid \text{number of zeroes in } x = \text{double number of one's in } x\}$

OR

Q.7B Explain classification of grammar. 05

Q.8A Find the language generated by the given PDA? 10



Identify the corresponding context free grammar.

Q.9A Construct context free grammar for the language supported by expression $0^*1^*1+11^*0^*1$ 10

Q.9B Describe a TM that recognizes the language $\{x^n y^{2n} \mid n \geq 0\}$ 10

OR

Q.9B State and prove ardens theorem. Construct a regular expression corresponding to the automata given below - 10

