Exam Date & Time: 09-Jun-2022 (02:00 PM - 05:00 PM)

MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL

unit of MAHE, Manipal)

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

Find grammar for $L = \{w : |w| \mod 3 \ge |w| \mod 2\}$. 1)

A)

B) Minimize the given DFA using Mark and Reduce Procedure



2) Prove that the language
$$L = \{a^n b^m c^{n+m} : n, m \ge 0\}$$
 is not regular.

A)
B) Construct an NPDA for the language
$$L = \{w \in \{a,b\}^* : n_a(w) = n_b(w)\}.$$

$$S \rightarrow aBcDE | CBD | ad$$

$$B \rightarrow cDE | bc | CD$$

$$C \rightarrow dd | ee | aC$$

$$D \rightarrow aCd | bC | d$$
(4)

(3)

(3)



Duration: 180 mins.

(3)

А

		$E \rightarrow CD \mid e$	
3)		Design a Turing machine M=(Q, \sum , $\hat{\Gamma}, \partial.q_0, \Box, F$) using transition diagram to accept the language L={a ⁿ b ^m c ^m d ^{n+m} : n,m>0}.	(5)
	A)		
	B)	What is ambiguous grammar? Check whether the grammar $E \rightarrow E+E \mid E*E \mid (E) \mid 2$ where E is the start variable and 2 is the terminal sybol, is ambiguos or not. Give derivation tree for $2 + 2 * 2$ using above productions.	(3)
	C)	Differentiate between the Types of languages classified in Chomsky Hierarchy.	(2)
4)		Design a Transducer using transition diagram to compute the difference between two positive integers, A and B where A>B with minimum states. The integers are represented in the Turing machine with corresponding number of 1's separated by a 0.	(5)
	A)		
	B)	Give Regular Expressions for the following:	
		i. String of a's and b's of even length	
		ii. String of a's and b's with odd number of b's.	(3)
		iii. String of length 3 of a's and b's whose 2 nd element from RHS is a.	
	C)	Check whether the language L={w w C{a,b} $*$ accepted by PDA is NPDA or DPDA.	(2)
5)	A)	Construct an NPAD that accepts the language generated by the grammar G=({A,B}, {0,1},S,P) where set of productions are given as S \rightarrow 0ABB 0AA , A \rightarrow 0BB 0, B \rightarrow bBB A. Using instantaneous description, show that, the string '0000' is accepted by the NPDA constructed by you.	(5)
	B)	Show that the L = {WW W \in {a,b} * } is not context free.	(3)
	C)	Design a DPDA to accept the language $L=\{0^n \ 1^{2n} \mid n \ge 1\}$.	(2)

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