T.E.(Computer) (Sem-V) (CBCGS) (R-20-21)

University of Mumbai

Examinations Summer 2022

Time: 2 hour 30 minutes | Subject: TCS | Max. Marks: 80

Theoretical Computer Science

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	**If L1 and L2 are context free language and R is a regular set, then which one of the languages below is not necessarily a context free language?**
Option A:	$L_1 L_2$
Option B:	$L_1 \cup L_2$
Option C:	$L1 \cap L2$
Option D:	$L_1 \cap R$
2.	**A Context Free Grammer G = (V , T , P , S) is said to be in _____, if every productions is of the form : $A \rightarrow a\alpha$ where a € T is a Terminal and α is a string of zero or more variables.**
Option A:	Unit production.
Option B:	Chomsky Normal form.
Option C:	Null production.
Option D:	Greibach Normal form.
3.	**Consider the following statements :** **I : Each Turing Acceptable language is need not to be Turing Decidable.** **II : Every Turing Decidable is Turing acceptable.**
Option A:	Only I is true.
Option B:	Only II is true.
Option C:	Both are false.
Option D:	Both are true.
4.	**FSM can recognize :**
Option A:	Only Context free grammer
Option B:	Only Context sensitive grammer
Option C:	Only regular grammar
Option D:	Any grammar
5.	**Recursively enumerable languages are not closed under :**

Option A:	Concatenation
Option B:	Complementation
Option C:	Homomorphism
Option D:	Union
6.	**If P , Q , R be the three regular expressions then the equation R = Q + RP has a unique solution given by :**
Option A:	R = RP
Option B:	R = QP*
Option C:	R = Q*P
Option D:	R= P*R
7.	**Every Context free language can not be recognized by a _____ , but it can be recognized by _____.**
Option A:	NPDA , DPDA .
Option B:	DPDA , NPDA .
Option C:	NPDA , NPDA .
Option D:	DPDA , DPDA .
8.	**If a language is denoted by a regular expression** L = (x)* (x | y x) , **then which of the following is not a legal string within L ?**
Option A:	yx
Option B:	xyx
Option C:	x
Option D:	x y x y x
9.	**Algorithmically , Which of the following conversion is not possible ?**
Option A:	Regular grammar to context-free grammar
Option B:	Non-deterministic PDA to deterministic PDA
Option C:	Non-deterministic TM to deterministic TM
Option D:	Non-deterministic FSA to deterministic FSA
10.	**_____ is the Type 1 grammer according to Chomsky Hierarchy.**

Option A:	Unrestricted Grammer.
Option B:	Regular Grammer.
Option C:	Context free Grammer.
Option D:	Context sensitive Grammer.

Q2	
A	***Solve any TWO*** ***5 marks each***
i	*Compare and Contrast Moore and Mealy Machine.*
ii	*Find the GNF equivalent to CFG :* $S \rightarrow AB$ $A \rightarrow aA \mid bB \mid b$ $B \rightarrow b$
iii	State and explain pumping lemma theorem for regular languages.
B	**Solve any One** **10 marks each**
i	Give the Moore and Mealy machine for the following processes : "For input from (0 + 1)* , if inputs ends in 101 , output x ; if input ends in 110 , output y ; otherwise output z " .
ii	Let G be the grammer : S → aB | bA A → a | aS | bAA B → b | bS | aBB Find : i) Left most derivation ii) Right most derivation iii) Parse tree iv) Is the grammer unambiguoous ? , for the given string 00110101 .

Q3	
A	***Solve any TWO*** ***5 marks each***
i	*Explain Non-deterministic PDA.*
ii	*Obtain DFA to accept strings of 0's and 1's with even no. of 0's and even no. of 1's.*

iii	Explain halting problem of Turing Machine.
B	**Solve any One** **10 marks each**
i	Design a Turing Machine to accept the language given by a regular expression 0 (0 + 1) * 1 1 .
ii	Construct the PDA accepting following language : $L = a^n b^m c^n \mid m , n >= 1$.

Q4	
A	***Solve any TWO*** ***5 marks each***
i	*Explain Chomsky Hierarchy.*
ii	*Describe Finite State Machine.*
iii	Construct left linear and right linear grammer for the regular expression : (((01 + 10) * 11) * 00)*
B	**Solve any One** **10 marks each**
i	Design a TM which recognizes words of the form $a^n b^n c^n \mid n >= 1$.
ii	Convert the following RE to €-NFA and then convert it to DFA : R = ((0 + 1) * 1 0 + (0 0) * (1 1) *) * .