Q. Code: 240300

Reg. No. | | | | | | | | | | | | | |

B.E./ B. TECH.DEGREE EXAMINATIONS, MAY 2024

Fifth-Semester

CS18503 – THEORY OF COMPUTATION

(Computer Science and Engineering)

(Regulation2018/2018A)

TIME:3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	The student will be able to design and build Finite Automata.	**3**
CO 2	The student will be able to implement prototype of compiler.	**3**
CO 3	The student will be able to develop the parsers and experiments its design.	**3**
CO 4	The student will be able to apply the various optimization techniques.	**3**
CO 5	The student will be able to use the different compiler construction tools.	**2**

PART- A(10x2=20Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Write the impact of proof by contradiction in solving the theorems.	**1**	**3**
2.	Compare and contrast between DFA and NFA-ξ	**1**	**3**
3.	Justify the need of pumping lemma for regular languages.	**2**	**3**
4.	Construct a regular expression for set of strings with at least one pair of consecutive 1's.	**2**	**3**
5.	Identify the language accepted by the following CFG G=({S,A},{a,b},{S→aSd | aAd, A→bAc | bc}, S).	**3**	**3**
6.	How to find out that a given CFG is ambiguous? Give an example.	**3**	**2**
7.	List the closure properties of CFL?	**4**	**3**
8.	Write the various programming techniques for Turing machine construction.	**4**	2
9.	State the purposes of $\mathbf{L_d}$ and $\mathbf{L_u}$.	**5**	**2**
10.	Write the importance of Halting Problem.	**5**	**2**

PART- B (5x 14=70Marks)

		Marks	CO	RBT LEVEL

11. (a) Obtain the DFA equivalent to the following NFA: **(14) 1 3**

state	Input symbols	
	0	**1**
→p	{p,q}	{p}
q	{r,s}	{t}
r	{p,r}	{t}
***s**	φ	φ
***t**	φ	φ

(OR)

(b) **(i)** Prove that a Language L is accepted by some DFA if and only if L is accepted by some NFA. **(8) 1 3**

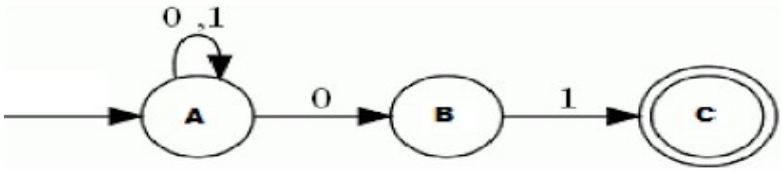
(ii) State the Induction Principle and Prove by Induction, For all n>=0: **(6) 1 3**

$$\sum^{n} i^3 = \{n(n+1)/2\}^2 .$$

12. (a) **(i)** Convert the regular expression **(0+11)*011** in to equivalent **NFA- ξ** **(6) 2 3**

(ii) **(8) 2 3**

Infer the Regular expression from the given **NFA** using $\mathbf{R_{ij}}$ method.



(OR)

(b) Construct the regular expression from the given DFA **(14) 2 3**

D= ({q1, q2, q3},{0,1},δ,q1,{q1}) where δ is given by the transition table using State elimination method.

State	0	1
→*q_1	q_1	q_2
q_2	q_3	q_2
q_3	q_1	q_2

13. (a) Consider the following grammar: **E->E+E | E-E | E*E | (E) | id** **(14) 3 3**

Construct the parse tree using LMD and RMD for the sentence

w= id*id*(id+id)*id. Also show that the above grammar is ambiguous?

(OR)

(b) **(i)** Convert the following grammar into PDA and also recognize the string w=00110101 **(6) 3 3**

S→0B | 1A
A→0 | 0S | 1AA
B→1 | 1S | 0BB

(ii) Design the PDA for the language, **L= {$a^m b^n c^m$ | n, m >=1}** using empty stack acceptance. **(8) 3 3**

14. (a) Convert the given CFG G =({S,A,B},{0,1},P,S} into CNF where P is given by **(14) 4 3**

S→ABA

A→ 0A | ξ

B→ 1B | ξ

(OR)

(b) **(i)** Design a Turing Machine for the language **L= { $a^n b^n$ | n>=1}.** **(8) 4 3**

(ii) Design a Turing Machine that accepts the language **$01^* + 10^*$** **(6) 4 3**

15. (a) **(i)** Prove that every non trivial property of the RE languages is undecidable. **(8) 5 2**

(ii) Prove that L_u is RE but not recursive. **(6) 5 2**

(OR)

			Marks	CO	RBT LEVEL
(b)	**(i)**	Prove that If both a language L and its complement are recursive enumerable, then L is recursive.	**(8)**	**5**	**2**
	(ii)	Discuss in detail about P and NP Problems with examples.	**(6)**	**5**	**2**

PART- C (1x 10=10Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	Convert the following grammar into GNF **S→AB** **A→BS | b** **B→SA | a**	**(10)**	**4**	**5**

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