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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fourth Semester, B.E. - Computer Science and Engineering

Semester End Examination; July/August - 2022

Theory of Computation

Time: 3 hrs *Max. Marks: 100*

***Note**: I) **PART - A** is compulsory. **Two** marks for each question.*

*II) **PART - B**: Answer any **Two** sub questions (from a, b, c) for a Maximum of **18 marks** from each unit.*

Q. No.	Questions	Marks
	I : PART - A	**10**
I a.	Define DFA.	2
b.	Define Regular Expression.	2
c.	Write CFG for the CFL L= $\{a^n b^{2n} \mid \geq 0\}$.	2
d.	Define DPDA.	2
e.	Define TM.	2
	II : PART - B	**90**
	UNIT - I	**18**
1 a.	Design a DFA to recognise all the strings, over $\sum$ = {a, b},which ends with '*aba*'.	9
b.	Convert the following NFA into its equivalent DFA and hence state the language recognised by the same.	9

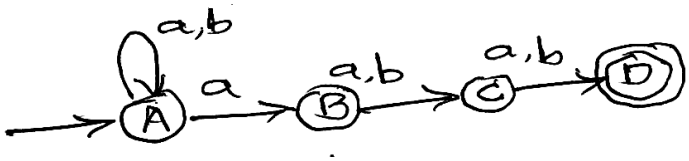

Fig Q1(b)

c.	Convert the following €-NFA into its equivalent DFA and hence state the language recognised by the same.	9

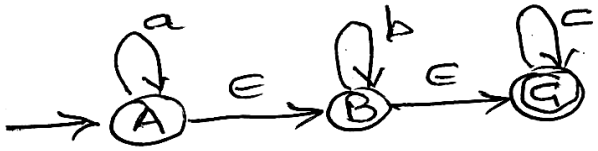

Fig Q1(c)

	UNIT - II	**18**
2 a.	Write regular expression for the following regular languages over $\sum$ = {a, b} i) Ends with either *abb* or *aba* or *aab* ii) L = $\{a^i b^j \mid (i+j)$ is even$\}$ iii) $\mid W \mid \bmod 3 = 2$	9

Contd…2

b. State and prove pumping lammra for regular languages. 9

c. Prove that for every regular expression ,R, representing the regular language L(R), there is an equivalent DFA,M such that L(M) = L(R). 9

UNIT - III **18**

3 a. Write CFG for the following CFLs:

i) $L=\{a^i b^j c^k \mid i=j \text{ or } j=k \text{ or } k=i\}$

ii) $L=\{a^i b^j c^k \mid i=3(j+k)\}$ 9

iii) Palindrome over $\sum=\{a, b\}$

b. Define ambiguous grammar and hence prove that the following grammar is ambiguous $E \rightarrow E+E \mid E*E \mid id$ 9

c. Convert the given CFG into its equivalent PDA

$E \rightarrow E+E \mid E*E \mid id$ 9

UNIT - IV **18**

4 a. Design PDA for the following CFL $L=\{a^i b^j c^k \mid i=j+k\}$ 9

b. Design PDA to recognise the CFL, $L=\{W \in \{a,b\}^* \mid n_a(W)= nb(W)\}$. State whether the resultant PDA is DPDA/NPDA. Justify your answer. 9

c. Define PDA, Instantaneous description a PDA and language accepted by PDA. 9

UNIT - V **18**

5 a. Design TM to recognize the language $L = \{a^n b^n c^n \mid n \geq 0\}$ 9

b. Explain any two extensions of TM. 9

c. Explain recursively enumerable languages and post's correspondence problem. 9

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