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Question Paper Code: U5E02

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Fifth Semester

Artificial Intelligence and Data Science

21UAD502- FORMAL LANGUAGES AND COMPUTATION

(Regulations 2021)

PART A - (10 x 2 = 20 Marks)

1. Summarize minimization of DFA CO1-U
2. Find DFA over $\Sigma=(a,b)$ which produces not more than $3a$'s. CO2-App
3. State pumping lemma and its advantages. CO1-U
4. Name the four closure properties of RE. CO1-U
5. Find CFG for the language $L=\{0^i1^j2^k|i=j\}$ CO2-App
6. Find PDA to accept the strings of the language, $L=\{a^n c^m b^n | n, m \geq 0\}$ CO2-App
7. Define the language recognized by any Turing Machine CO1-U
8. Eliminate the ϵ productions from the CFG given below CO2-App
 $A \rightarrow 0B1|1B1$ $B \rightarrow 0B|1B|\epsilon$
9. Describe an example of undecidable problem CO1-U
10. What is meant by halting problem CO1-U

PART – B (5 x 16= 80 Marks)

11. (a) (i) Construct the following NFA to DFA.

CO2-App (16)

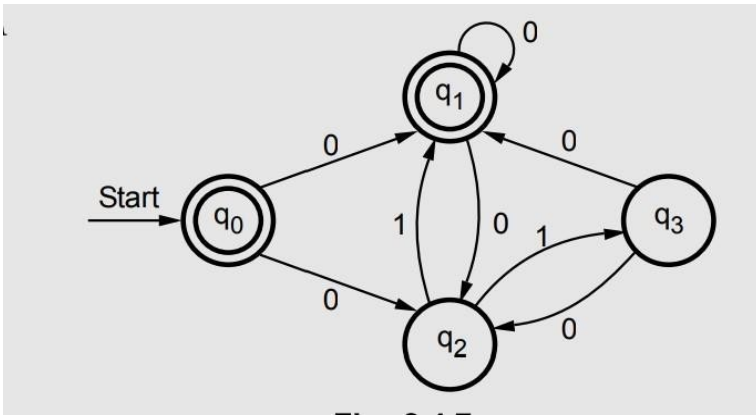
States	a	b
P	{p}	{p, q}
q	{r}	{r}
r*	ϕ	ϕ

- (ii) Construct a DFA accepting binary strings such that the third symbol from the right end is 1.

Or

(b) (i) Convert the following NFA into DFA

CO2-App (16)



(ii) Construct a NFA to accepting the set of strings over {a,b} ending in aba. Use it construct a DFA accepting the same set of strings.

12.(a) Construct NFA for given R using Thomson rule.

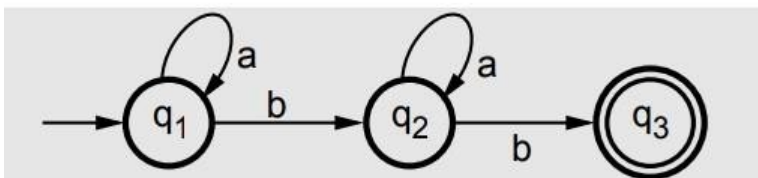
CO2-App (16)

- i) $a.(a+b)^*ab$
- ii) $(a.b)^*$
- iii) $(a+b)$

Or

(b) (i) Find the regular expression for finite automata

CO2-App (16)



(ii) Construct a finite automata for the regular expression $10+(0+11)0^*1$

13. (a) Solve the following grammar

CO2-App (16)

$S \rightarrow aAa|bBb|BB$

$A \rightarrow CB \rightarrow S|A$

$C \rightarrow S|\epsilon$ for the string abaaba. Find

- (i) Left most derivation
- (ii) Right most derivation
- (iii) Derivation Tree
- (iv) For the string abaabbba, find the right most derivation.

Or

- (b) Consider the following grammar for productions: CO2-App (16)
 $S \rightarrow a^i | (T) T \rightarrow T, S | S$. Find the left most derivation and right most derivation and parsetree for $((a, a), (^, a), a)$
14. (a) (i) Explain two types of normal form and gives an example. CO1- U (16)
(ii) Explain the null productions, Unit production and Useless symbols in production with example.
- Or
- (b) Define and prove the any four closure properties of context free languages CO1- U (16)
15. (a) Describe about the tract able and intractable problem swith an examples. CO1-U (16)
- Or
- (b) (i) Define PCP and prove that PCP is undecidable. CO1-U (16)
(ii) Explain that“MPCP reduce to PCP”.

