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B. E. (Fifth Semester) Examination, April-May/Nov.-Dec. 2020

(New Scheme)

(IT Engg. Branch)

THEORY of COMPUTATION

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Part (a) of each question is compulsory and carry 2 marks. In remaining part (b), (c) and (d). Attempt any* ***two*** *and each carry equal marks.*

Unit-I

1. (a) The transition function of NFA with $\in$ is defined by

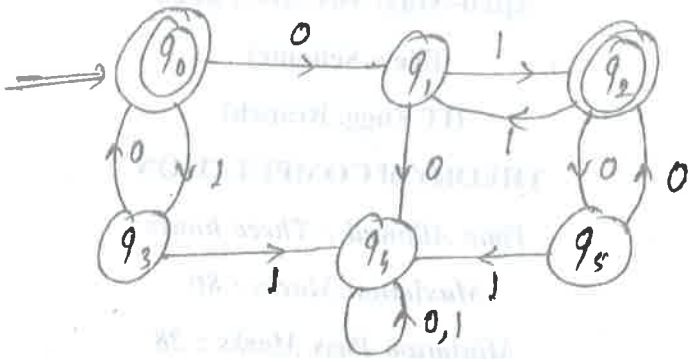
(i) $Q \times \Sigma$ to Q

(ii) $Q \times \Sigma$ to 2^Q

(iii) $Q \times \{ \Sigma \cup \in \}$ to 2^{θ}

(iv) $Q \times \{ \Sigma \cup \in \}$ to Q 2

(b) Construct minimum state automata equivalent to the following DFA. 7

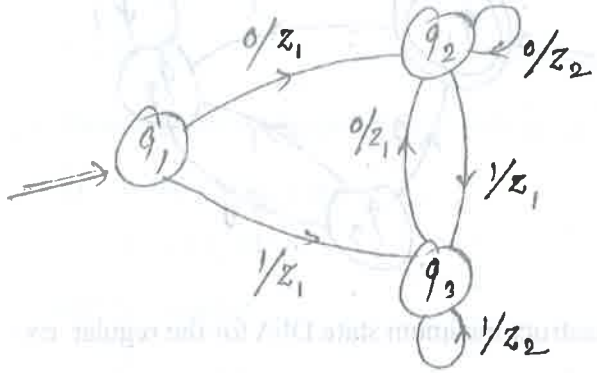


(c) Construct equivalent a deterministic finite automata equivalent to $M = \left(< q_0, q_1, q_2, q_3 \}, \{ 0, 1 \}, \delta, q_0, \{ q_3 \} \right)$ where is given by

state \ Σ	a	b
→ q_0	q_0, q_1	q_0
q_1	q_2	q_1
q_2	q_3	q_3
(q_3)		q_2

7

(d) Consider the Mealy machine represented by following diagram. Construct equivalent Moore Machine and find outcome for input 0011 in both Mealy and Moore machine.



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Unit-II

2. (a) The regular expression $(P+Q)^*$ is equal to : 2

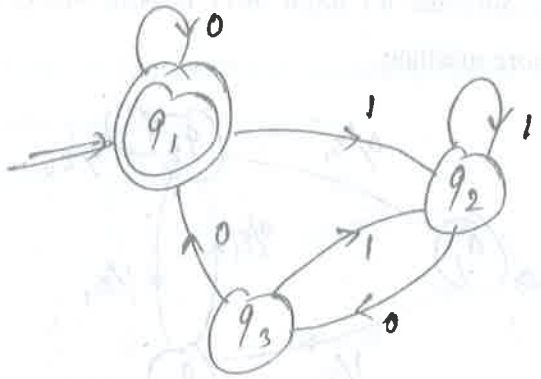
(i) $(P^*Q)^*$

(ii) $(PQ^*)^*$

(iii) $(PQ)^*$

(iv) $(P^* + Q^*)^*$

(b) Construct regular expression corresponding to following state diagram. 7



(c) Construct minimum state DFA for the regular expression

$$10+(0+11)0^*1.$$ 7

(d) What is pumping lemma? Prove what language $L = \{ 0^j, 1^j / j \geq 1 \}$ is not regular? 7

Unit-III

3. (a) Consider the set of production P of some grammar G as

$$S \rightarrow a\,S/Sb/a/b$$

The above production support the format of

(i) Regular grammar

(ii) Content free grammar

(iii) Regular and content free grammar

(iv) None 2

(b) Show that following grammar is ambiguous :

(i) $S \rightarrow a/abSb/aAb$

$A \rightarrow bS/aAAb$ 3½

(ii) $S \rightarrow aB/ab$

$A \rightarrow aAB/a$

$B \rightarrow ABb/b$ 3½

(c) Reduce the following CFG to GNF.

$S \rightarrow ABb/a,\ A \rightarrow aaA,\ B \rightarrow bAb$ 7

(d) Find an equivalent CNF grammar for the following grammar :

$S \rightarrow \sim S \,|\, [\ S \supset S\ ] \,|\, p/q$ (S being the only variable). 7

Unit-IV

4. (a) $\{a^n\, b^n / n \geq 1\}$ is accepted by a PDA

(i) by null store and also by final state

(ii) by null store but not by final state

(iii) by final state but not by null store

(iv) by none of these 2

(b) Design deterministic PDA for the following language

$L = \{ WCW^R / W \in (0+1);$

W^R is reverse of W and C is a terminal symbol $\}$ 7

(c) Design a turing machine to accepts.

$$L = \{ 0^n, 1^n / n \geq 1 \}$$ 7

(d) Write short notes on following :

(i) Post Correspondence problem 3½

(ii) Church's Hypothesis 3½

Unit-V

5. (a) The evaluated value of composition function

$S\left(Z\left(U_1^3(2, 4, 7)\right)\right)$ is

(i) 2

(ii) 4

(iii) 7

(iv) 1 2

(b) Show that the function $f(x, y) = x + y$ is primitive recursive. 7

(c) Construct Turing Machine what can compute the zero initial function ; Z. 7

(d) Explain recursive and recursive enumerable language in detail. 7