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Roll No. :

322514(22)

**B. E. (Fifth Semester) Examination,
April - May 2021**

(Old Scheme)

(CSE Engg. Branch)

THEORY of COMPUTATION

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Attempt all questions. Part (a) of each question is compulsory. Attempt any two parts from (b), (c) and (d). Part(a) carries 2 marks, Part (b), (c) and (d) carries 7 marks.

Unit-I

1. (a) Design FA for $r = a^* b a^*$

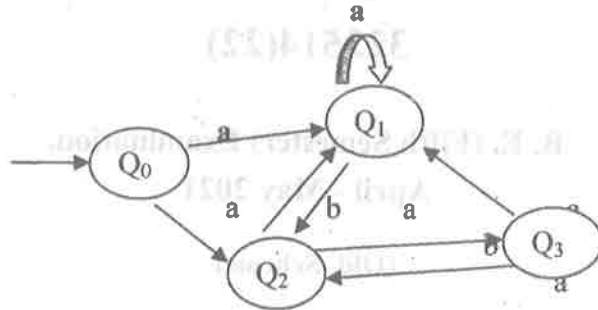
2

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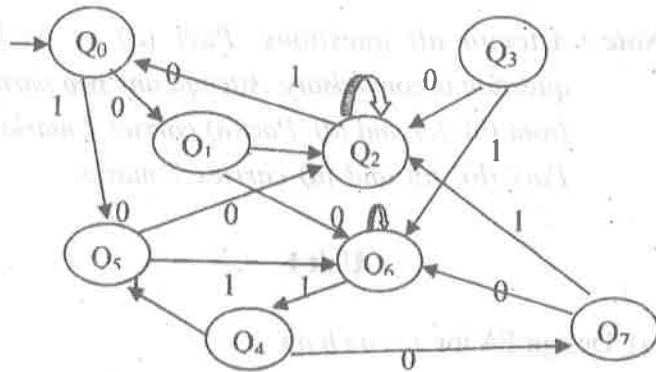
PTO

[2]

- (b) Difference between NFA & DFA & design DFA for given NFA - where Q_0 & Q_1 are final state. 7



- (c) Explain Myhill Nerode's theorem? 7
- (d) Construct minimum state automation equivalent to the finite automaton given as — where Q_2 is final state. 7

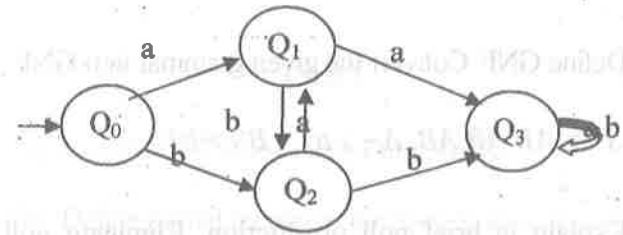


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[3]

Unit-II

2. (a) Define Regular Expression with example? 2
- (b) Find the regular expression for given diagram - 7
where Q_2 & Q_3 are final state.



- (c) Construct a DFA with reduced states equivalent to the regular expression

$$R = (a+b)^*(aa+bb)(a+b)^*? \quad 7$$

- (d) Explain pumping lemma and prove that $L = \{a^p \mid p \text{ is prime}\}$ is not regular? 7

Unit-III

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3. (a) Define Ambiguity. If g is the grammar $S \rightarrow SbS/a$.
Show that g is ambiguous. 2
- (b) Consider a grammar G whose production rules are : 7
 $S \rightarrow 0B/1A$, $A \rightarrow 0/0S/1AA$, $B \rightarrow 1/1S/0BB$
Find LMD & RMD for string 00110101 & construct
a derivation tree.
- (c) Define GNF. Convert the given grammar into GNF. 7
 $S \rightarrow AB AB AB$, $A \rightarrow a/^\wedge$, $B \rightarrow b/^\wedge$
- (d) Explain in brief null production. Eliminate null
production of given Grammar. 7
 $S \rightarrow aS/AB$, $A \rightarrow ^\wedge$, $B \rightarrow ^\wedge$, $D \rightarrow b$

Unit-IV

4. (a) Define PDA & also design PDA for CFL,
 $\{w c w^r / w = (0+1)^* \text{ \& } w^r \text{ is reverse of } w\}$ 2
- (b) Construct a PDA A equivalent to the following
CFG : $\rightarrow S 0BB$

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- $\rightarrow B 0S/1S/0$
- Test whether 010⁴ is in $N(A)$ 7
- (c) Design a TM that accept $\{0^n 1^n / n > 0\}$ and show
the Transition table & Transition diagram of TM. 7
- (d) Design a TM to recognize the lanugage
 $\{1^n 2^n 3^n / n > 0\}$ 7

Unit-V

5. (a) Construct TM for Zero Function Z. 2
- (b) Define partial recursive function & also prove that a
function $f(x) = x/2$. Is partial recursive function
over N (natural number). 7
- (c) Describe the Space & Time complexity in detail. 7
- (d) Write short notes on : (any two) 7
- (i) Church's Hypothesis
 - (ii) Myhill Nerode's theorem
 - (iii) PCP
 - (iv) Computability