SE Sem IV (C Scheme R-2019) "ECS" Dec'2022

19/12/2022

(3 Hours) [Total Marks: 80]

N.B. : (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

1 Attempt any FOUR

a Transform the following formula into CNF $\sim(p \rightarrow q) \vee (r \rightarrow p)$ [05]

b If A ={1, 2,3, 4} and B={ a b c d} , determine whether the following functions are one-to-one or onto. [05]

f={ (1,a),(2,a),(3,b),(4,d)}

g= (1,d),(2,b),(3,a),(4,c)

c Define regular expression and write a regular expression for language: [05]

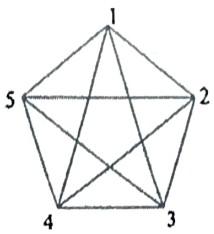
i) Strings containing at least one 'a' over $\Sigma = \{a, b, c\}$.

ii) Strings containing odd number of b's over $\Sigma = \{a, b\}$.

d Differentiate between Moore and Mealy machine. [05]

e Prove using Mathematical Induction that :- $1+3+5+...+(2n-1) = n^2$ [05]

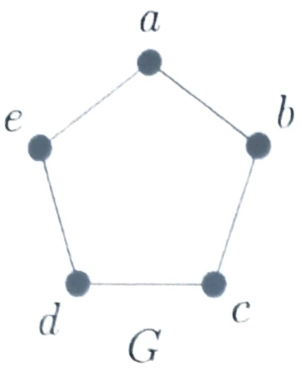
2 a Define with example Euler path, Euler circuit, Hamiltonian path, and Hamiltonian circuit. Determine if the following diagram has Euler circuit and Hamiltonian circuit and state the path/circuit. [10]

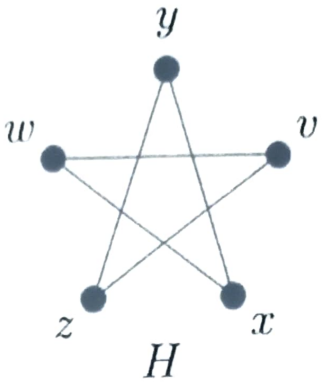


b Write short note on Types of Grammar [10]

3 a Draw the Hasse diagram for D105 and [10]
i) Write the pairs in a relation set R.
ii) What are the Maximal and Minimal elements?
iii) Mention Chains and Ant chains from above set.
iv) Is it a lattice?

b Define Isomorphic graphs.Check whether following graphs are Isomorphic? [10]





4 a Design DFA in which input is valid if it starts either in '011' or '100' over $\Sigma=\{0,1\}$. [10]

b Design Moore m/c to change occurrence of "abb" to "aba" over $\Sigma=\{a,b\}$. [10]

5 a Design NFA for recognizing the strings that end in "aa" over $\sum = \{a,b\}$ & convert above NFA to DFA. [10]

b Let G be the grammar [10]

$S \rightarrow aB \mid bA$

$A \rightarrow a \mid aS \mid bAA$

$B \rightarrow b \mid bS \mid aBB$

Find leftmost derivation, rightmost derivation and parse tree for the string "bbaaabbaba".

6 a Reduce the following Grammars to the Chomsky normal form [10]

$S \rightarrow 1A \mid 0B$

$A \rightarrow 1\ AA \mid 0S \mid 0$

$B \rightarrow 0BB \mid 1S \mid 1$

b Define PDA and design a PDA to accept an odd length palindrome over {a,b}. [10]

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