Paper / Subject Code: 41024 / Automata Theory

May 24, 2024   02:30 pm - 05:30 pm   1T01234 - S.E.(Information Technology Engineering)(SEM-IV)(Choice Base Credit Grading System) (R- 19) (C Scheme) / 41024 - Automata Theory   QP CODE:10055336

Duration: 3 Hours   **Total Marks: 80**

Note:- 1) Question No. 1 is Compulsory.
        2) Solve any three out of remaining questions.

Q.1) Answer any **Four**.

a) Describe Moore machine with all tuples in detail.   **(05)**

b) Find the Regular Expression corresponding to the grammar   **(05)**

$$S \rightarrow AB / AS$$
$$A \rightarrow a / aA$$
$$B \rightarrow b$$

c) Construct mealy machine to accept all strings ending with 00 or   **(05)**
   11.

d) Write a note on Universal Turing Machine.   **(05)**

e) Draw diagram for Chomsky hierarchy and Show all the types   **(05)**
   with proper explanation.

Q.2)

a) Design NFA for accepting input strings that contain either the   **(10)**
   keyword 000 or the keyword 010 and convert it into an equivalent
   DFA .

b) Design a DFA corresponding to regular expression   **(10)**
   $(a+b)*aba (a+b)*$

Q.3)

a) What are Moore and Mealy machines?   **(10)**
   Design a Moore and Mealy machines to convert all occurrences
   of '1110' to '1011' over Σ {0, 1}.

b) Define CFG, obtain CFG for the following grammar   **(10)**
   $(110+11)*(10)*$

Q.4)

a) Construct a Turing machine accepting palindromes over $\sum=\{a,b\}$ **(10)**

b) Discuss power and limitations of PDA. Compare it with FA and   **(10)**
   TM.

Q.5)

a)   i) Define CFG.   **(02)**

ii) Find the leftmost derivation, rightmost derivation and parse   **(08)**
trees for the string   " aaabbabbba" using CFG:

$$S \rightarrow aB / bA$$
$$A \rightarrow aS / bAA / a$$
$$B \rightarrow bS / aBB / b$$

b)   Construct NFA for Binary strings that begin with 11 and end with   **(10)**
11 or begin with 00 and end with 00

Q.6)   Write short notes on any **TWO**   **(20)**

     i.   Halting Problem in TM
     ii.   Greibach Normal Form (GNF)
     iii.   Applications of FM, PDA and Turing Machine with
        example

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