4E1306

Total No. of Questions : 22 Total No. of Pages : 04

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4E1306

B.Tech. IV-Sem. (Main/Back) Exam. - 2024

COMPUTER SCIENCE AND ENGINEERING (AI)

4CA14-06 Theory of Computation

CS, IT, AID, CAI

Time : 3 Hours Maximum Marks : 70

Instructions to Candidates :

Attempt all ten questions from Part-A, five questions out of seven questions from Part-B and three questions out of five questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(As mentioned in Form No. 205)

1. ..... 2. .....

PART-A

(Answer should be given up to 25 words only) **[10×2=20]**

All questions are compulsory

Q.1. Design a DFA which accepts strings with even number of 1's on S = {0, 1}.

Q.2. Write the regular set of following regular expression :

(a + b) * (aa + bb + ab + ba)*

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Q.3. Is $L = \{a^{2n} / n \geq 1\}$ regular?

Q.4. Let $G = (V, \Sigma, R, S)$ be the context-free grammar, where $V = \{A, B, S\}$, $\Sigma = \{a, b\}$, S is the start variable, and R consists of the rules :

$S \rightarrow aB|bA$

$A \rightarrow a|aS|BAA$

$B \rightarrow b|bS|ABB$

Prove that ababba $\in$ L(G)

Q.5. What is ambiguity? Explain with example.

Q.6. What is the difference between Finite Automata and Pushdown Automata?

Q.7. Define the recursive and recursively enumerable languages.

Q.8. Draw the diagram of Multiple Tracks Turning Machine.

Q.9. Write the generic Form of the production of Context sensitive grammars.

Q.10. What are the Tractable and Untractable Problems?

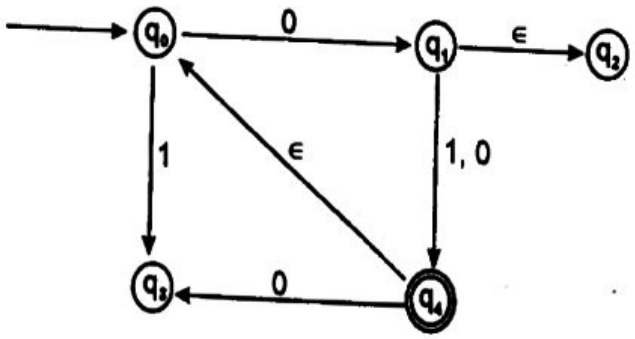
PART-B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1. Convert the given NDFA to its equivalent DFA :



Q.2. Construct the finite automation equivalent to the regular expression $(0 + 1)^*(00+11)(0 + 1)^*$.

Q.3. Explain the role of Finite Automata and Regular Expression in Compiler Design.

Q.4. Design the context free grammar for the languages $L = \{a^i b^j c^k \mid i = j + k\}$.

Q.5. Explain the working of Pushdown Automata with mathematical description.

Q.6. Explain the Chomsky Classification of Languages with the help of examples.

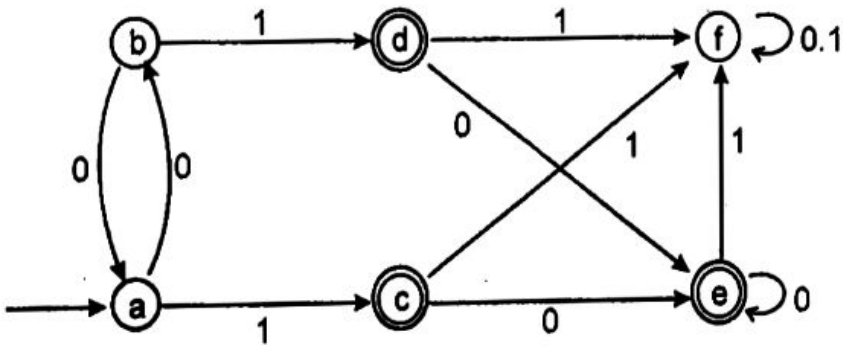
Q.7. What are the NP complete and NP hard problems? In which category Hamiltonian path problem and travelling salesman problem lies and why?

PART-C **[3×10=30]**

(Descriptive/Analytical/Problem solving/Design questions)

Attempt any three questions

Q.1. Minimize the DFA as shown in below figure :



Q.2. Show that the language $L = \{a^n b^m : n \neq m\}$ is not regular.

Q.3. Explain the following :

(a) Leftmost derivation

(b) Rightmost derivation

(c) Sentential forms

(d) Null production

Q.4. Construct a PDA accepting the set of all strings over {a, b} with equal number of a's and b's.

Q.5. Design a Turning machine over {1, b} which can compute a concatenation function over $L = \{1\}$. If a pair of words (w_1, w_2) is the input and output has to be $w_1 w_2$.

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