

BANKURA UNIVERSITY

B.SC(HONS) FIFTH SEMESTER EXAMINATIONS, 2021

Subject: Computer Science

Course ID: 51512

Course Title: Theory of Computation

Full Marks: 40

Time: 2 Hrs

The figures in the margin indicate full marks

Answer all the questions.

UNIT I

1. Answer *any five* of the following questions: (5x1=5)

- a) Define finite Automata
- b) What is regular expression?
- c) Define pushdown automata.
- d) Find all strings of length 4 or less from $L=(a+b)^*ab$
- e) State Arden's theorem.
- f) Give example of two context free languages.
- g) Define regular grammar.
- h) Write two differences between nfa and dfa.

UNIT II

2. Answer *any two* of the following questions: (5x2=10)

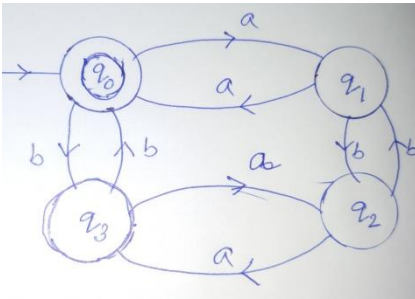
- a) Draw a dfa for $L=(a+b)^*ab$. Find a regular expression for "all strings of a, b with even number of b". 3+2=5
- b) Design a pda for $L=\{ a^n b^n : n>0 \}$. Explain functioning of it with instantaneous description. 4+1=5
- c) Write context free grammars for $L=\{ a^n b^m c^m : n>0, m>0 \}$ & $L=\{ a^n b^m : n>0, m>0, n \neq m \}$ 2.5x2=5
- d) Design a Turing machine for $L=\{ a^n b^n : n>0 \}$.

UNIT III

3. Answer *any one* of the following questions:

(10x1=10)

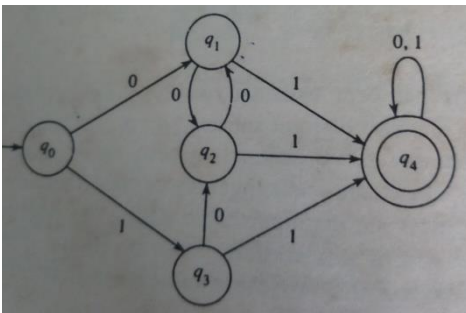
a) Find a regular expression for the following dfa-



q_0 is the final state. Prove that $L = \{ a^n b^n : n > 0 \}$ is not a regular language.

6+4=10

b) Minimize the following dfa:



Explain the Chomsky hierarchy of languages.

6+4=10