

Tribhuvan University
Institute of Science and Technology

2081



Bachelor Level / Second Year/ Forth Semester/ Science
Computer Science and Information Technology (CSC 262)
(Theory of Computation)
(NEW COURSE)

Full Marks: 60
Pass Marks: 24
Time: 3 hours.

Candidates are required to give their answers in their own words as far as practicable.
All figures in the margin indicate full marks.

Section A

Long Answer Questions.

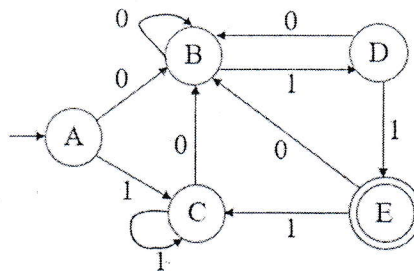
Attempt any TWO questions.

[2×10=20]

1. Mention the transition function of PDA. List the two ways that PDA accepts the string. Convert the following CFG to PDA.
 $S \rightarrow AS \mid \epsilon$
 $B \rightarrow aAb \mid Bb \mid ab$

[2 + 2 + 6]
2. List any two regular operators. Minimize the following finite state machine using Table Filling algorithm.

[2 + 8]



3. Define Turing machine as enumerators of strings of a language. Encode the Turing machine $TM = (\{q_0, q_1, q_2\}, \{a, b\}, \{a, b, B\}, \delta, q_0, B, F)$, with input $w = ba$ and δ is defined as follows.
 $\delta(q_0, b) = (q_2, a, R)$, $\delta(q_2, a) = (q_1, b, R)$, $\delta(q_2, b) = (q_1, a, R)$, $\delta(q_2, B) = (q_2, b, L)$

[1 + 9]

Section B

Short Answer Questions

Attempt any EIGHT questions.

[8×5=40]

4. Does machine always refer to hardware? Justify. Define positive closure and kleene closure.

[2 + 3]
5. What is undecidable problem? Discuss about Post's Correspondence Problem. [1 + 4]
6. Define the language of a grammar. For the grammar $S \rightarrow 0S0 \mid 0 \mid 1 \mid \epsilon$, show the leftmost derivation for the string 00100 with its parse tree.

[1 + 4]
7. Define ϵ - closure of a state. Differentiate between Moore and Mealy machine. [2 + 3]

8. Represent the following regular grammar to finite automata. [5]

$$S \rightarrow a \mid aA \mid bB \mid \epsilon$$

$$A \rightarrow aA \mid aS$$

$$B \rightarrow bS \mid \epsilon$$

9. Design the DFA that accepts binary string ending with "00" and show its extended transition function for the string 111000. [5]

10. Convert the following grammar to CNF. [5]

$$S \rightarrow AAB, A \rightarrow aAb \mid \epsilon, B \rightarrow aB \mid a$$

11. For the following Turing Machine, test whether the string "() (" is accepted or rejected and represent it in transition diagram. [5]

	()	X	Y	B
q ₀	(q ₁ , X, R)	-	-	(q ₃ , Y, R)	-
q ₁	(q ₁ , (, R)	(q ₂ , Y, L)	(q ₀ , X, R)	(q ₁ , Y, R)	-
q ₂	(q ₂ , (, L)	-	(q ₀ , X, R)	(q ₂ , Y, L)	-
q ₃	-	-	-	(q ₃ , Y, R)	(q ₄ , B, R)
q ₄	-	-	-	-	-

12. Differentiate between Class P and Class NP problem. Mention the transition function of DFA, NFA and ϵ -NFA. [2 + 3]