Tribhuvan University
Institute of Science and Technology
2081
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Bachelor Level / Second Year/ Forth Semester/ Science — Full Marks: 60
Computer Science and Information Technology (CSC 262) — Pass Marks: 24
(Theory of Computation) — Time: 3 hours.
(NEW COURSE)

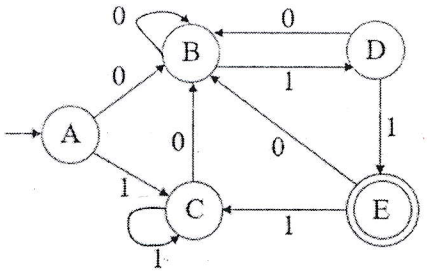
Candidates are required to give their answers in their own words as for as practicable.
All figures in the margin indicate full marks.

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. [2 + 2 + 6]
   $S \rightarrow AS \mid \in$
   $B \rightarrow aAb \mid Bb \mid ab$

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}, δ, 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 $S \rightarrow 0S0 \mid 0 \mid 1 \mid \in$, show the leftmost derivation for the string 00100 with its parse tree. [1 + 4]

7. Define $\in$ - closure of a state. Differentiate between Moore and Mealy machine. [2 + 3]

8. Represent the following regular grammar to finite automata. [5]
   $S \rightarrow a \mid aA \mid bB \mid \in$
   $A \rightarrow aA \mid aS$
   $B \rightarrow bS \mid \in$

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

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 $\in$ - NFA. [2 + 3]