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CBCS SCHEME

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21CS51

Fifth Semester B.E./B.Tech. Degree Examination, June / July 2026
Automata Theory and Compiler Design

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Define the following terms :
(i) Alphabet (ii) String (iii) Length of String
(iv) Power of an alphabet (v) Language **(05 Marks)**

b. Design DFA for the following languages over $\Sigma = \{a, b\}$
i) $L = \{ w : |w| \bmod 3 > |w| \bmod 2 \}$

ii) The set of all strings containing the substring 'ab' at the end. **(08 Marks)**

c. Convert the following NFA to its equivalent DFA.

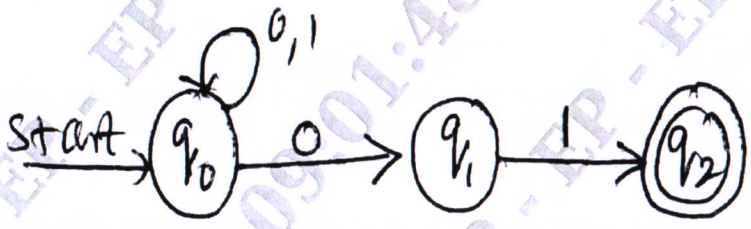

Fig. Q. 1 (c) **(07 Marks)**

OR

2 a. Construct a minimized DFA for the following:

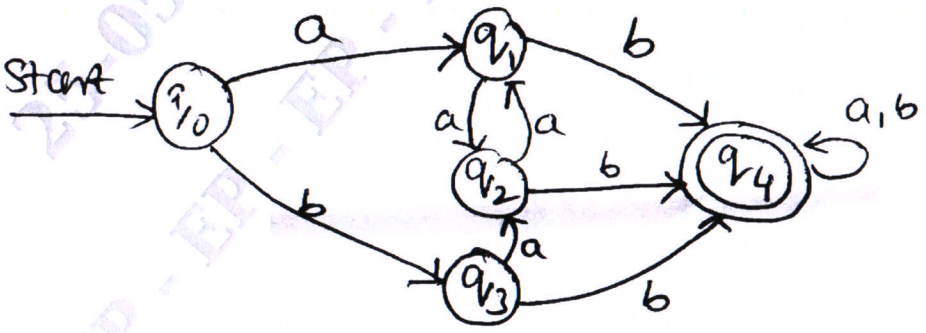

Fig. Q. 2 (a) **(08 Marks)**

b. With the help of a diagram, explain various phases of compiler. Also show the steps in translation of an assignment statement.
Position = initial + rate * 60 **(12 Marks)**

Module-2

3 a. Define Regular expression. Construct the regular expressions for the following languages:

(i) Strings of a's and b's whose 3rd symbol from right is a
(ii) $L = \{ a^{2n} b^{2m+1} : m \geq o, n \geq o \}$ **(06 Marks)**

b. Construct an equivalent regular expression for the following DFA using state elimination method.

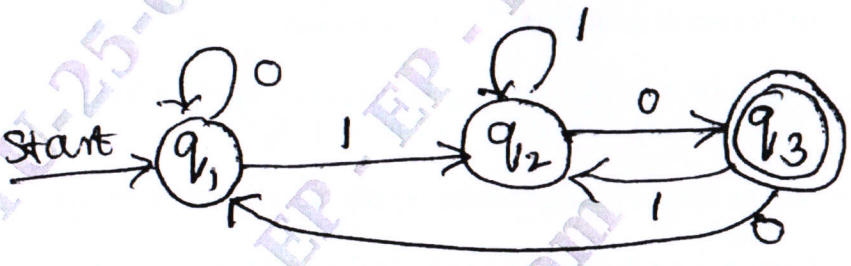

Fig. Q. 3 (b)

(08 Marks)

c. Convert the regular expression $(0 + 1)^* 1 (0 + 1)$ to a ε-NFA. **(06 Marks)**

OR

4 a. With a neat diagram explain input buffering schemes of lexical analyses. **(10 Marks)**

b. Construct the transition diagrams to recognize the following tokens.
i) reloperators ii) id and keywords iii) Unsigned numbers **(10 Marks)**

Module-3

5 a. Define Context free Grammar. Obtain the CFG for the following languages:
i) $L = \{ a^m b^n : m \geq 1, n \geq 1 \}$

ii) $L = \{ O^n 1^n : n \geq 0 \}$ **(06 Marks)**

b. Consider the following CFG with productions.
$E \rightarrow E + T \mid T$
$T \rightarrow T * F \mid F$
$F \rightarrow (E) \mid id,$

Write the LMD, RMD and Parse tree for the string id * (id + id). **(09 Marks)**

c. Consider the CFG given in Q. 5 (b), eliminate the left recursion. **(05 Marks)**

OR

6 a. With a net diagram explain the rule of a Parser. **(05 Marks)**

b. Consider the grammar,

$S \rightarrow iEtSS' \mid a$

$S' \rightarrow eS \mid \in$

$E \rightarrow b$

Construct Predictive Parsing table. **(10 Marks)**

c. Briefly explain error recovery strategies of Predictive Parser. **(05 Marks)**

Module-4

7 a. Define PDA. Explain the working of PDA with a neat diagram. **(05 Marks)**

b. Design a PDA to accept the language
$L = \{ WW^R \mid W \in \{a, b\} \}$ by a final state. **(05 Marks)**

c. What is Shift- Reduce Parsing? List the possible actions. Show the configurations of a Shift – Reduce Parser on the input $id_1 * id_2$. **(10 Marks)**

OR

8 a. Construct the SLR Parsing table for the grammar given in Q. 5 (b). **(12 Marks)**

b. Construct LR(1) Automation for the grammar
$S \rightarrow CC$, $C \rightarrow cC \mid d$ **(08 Marks)**

Module-5

9 a. With a neat diagram, explain the working of basic Turing machine. **(05 Marks)**

b. Design a Turing machine to accept the language
$L = \{ 0^n 1^n \mid n \geq 1 \}$ **(10 Marks)**

c. Write a short note on multitape Turing machine. **(05 Marks)**

OR

10 a. Give SDD for a simple desk calculator. **(05 Marks)**

b. Construct DAG for the expression
$a + a * (b - c) + (b - c) * d$ **(05 Marks)**

c. List and briefly explain the issues in the design of a code generator. **(10 Marks)**

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