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Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science & Engineering

Mid Term Examination, Fall 2026

Course Code: CSE228, Course Title: Theory of Computation

Batch: 68

Time: 1:30 Hrs **Marks: 25**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1. a) Consider the alphabet, $\Sigma = \{a, b, c\}$.

i) Explain the meaning of Σ^2 by generating the corresponding strings.

(ii) Describe the difference between an alphabet set and a language.

[2] **CO1**

b) Interpret the string "00111" using the extended transition function for the following NFA.

Transition table (δ):

States	0	1
→A	{A,B}	{A}
B	{C}	{C}
C	{D}	∅
*D	{D}	{D}

[3] **CO1**

2. a) Apply the knowledge of NFA to to design NFA's for the following:

(i) To recognize the following set of strings: {0101, 101,011} over the alphabet set {0,1}.

(ii) L={W|W ends with ab or bab} over the alphabet Σ={a,b}.

[2] **CO2**

b) Apply the knowledge of DFA to design DFA's for the following:

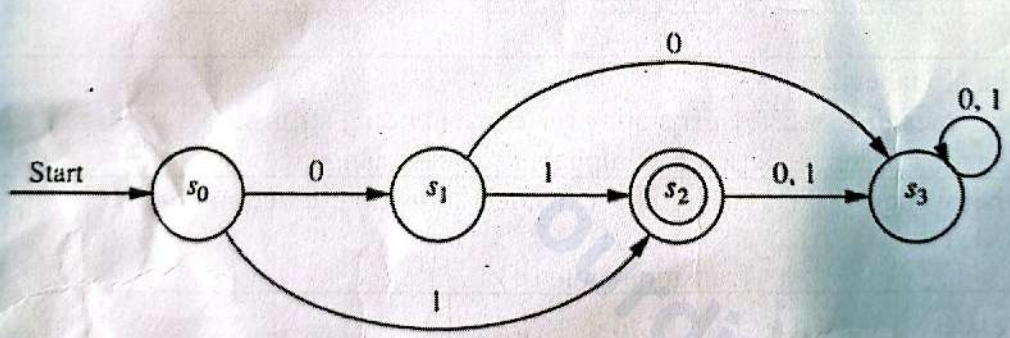
i) L={W | W has an even number of a's or an odd number of b's} over the alphabet Σ={a,b}.

ii)The set of all strings that do not contain 00 over the binary alphabet Σ={0,1}.

(iii) To verify employee ID's ranging from FACULTY-001 to FACULTY-982 of Daffodil International University. The DFA should accept all valid employee ID's within this range and reject ID's below FACULTY-001 or above FACULTY-982. Construct only the DFA transition diagram.

[5] **CO2**

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	C)	(i)Apply the knowledge of conversion NFA to DFA, convert the NFA in the given 1(b), into DFA.	[3]	
3.	a)	Construct the regular expressions for the following languages over {0, 1}: i) The set of all strings that contain that start with **0** and end with 01. ii) The set of all strings that contain 1011 as a substring in the middle. iii) The set of all strings where the number of 1's is divisible by three.	[3]	CO2
	b)	Convert the RE into NFA with ε transition over the alphabet set {a,b}: i. (a+b)*bab* ii. ((ba*)*+a)*bb	[3]	
	C)	 Convert the above DFA into equivalent RE.	[4]	