Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science & Engineering

Mid Tem Examination, Spring 2026

Course Code: CSE228, Course Title: Theory of Computation

Time: 1:30 Hrs **Level:2 Term:2 Batch :67** **Marks: 25**

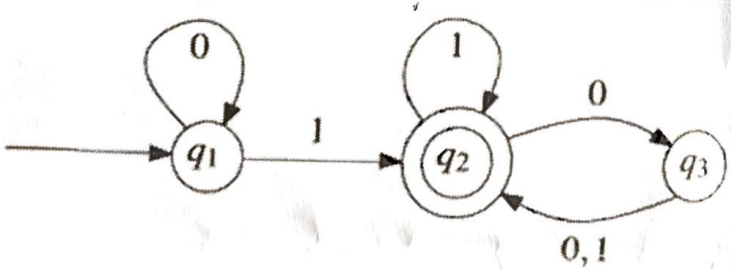
Answer ALL Questions

[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 set, $\Sigma = \{x, y\}$. **i)** Compute Σ^4. How many strings can be generated if someone wants to generate only 5 length strings?	[2]	CO1
	b)	Evaluate the string "abbab" using the extended transition function for the following NFA. Transition table (δ):	[2]	

States	a	b
→p	{p,q}	{p}
q	{r}	{r}
r	{s}	∅
*s	{s}	{s}

2.	a)	**i)**Design a NFA over the alphabet {0, 1} that accepts all strings that contain at least one 0 and at most two 1's. **ii)** Design a NFA that accepts strings over the alphabet {a, b, c} that contain at most 4 occurrences of b. **iii)** Give a NFA accepting the following language over the alphabet {a, b}: the set of strings that end with ba, bb and baa.	[3]	CO2
	b)	Apply the knowledge of DFAto design DFA's for the following: **i)** A new MRT ticket-vending machine is being designed that issues a ticket only when exactly Tk 25 has been inserted, and accepts only note denominations of 5 taka, 10 taka, or 25 taka. The machine is automated using a deterministic finite automaton. If at any step the cumulative amount inserted would exceed 25, the machine should move to a "trap" (dead) state and never issue a ticket. If the insertion ends with a total less than 25, the machine should reject the ticket. Only sequences of note insertions whose sum is exactly 25 should lead to acceptance. **ii)**The set of strings containing the substring aba or bab anywhere.	[3+2]	

	c)	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 {a, b}: **i)** The set of all even length strings that contain exactly two b's. **ii)** The set of all strings that contain the substring aba and the substring bab. **iii)** L={w∈{a,b} | The 3rd symbol from the left is b}.	[3]
	b)	Convert the RE into NFA with ε transition: i. (a+b)*(abb+a*b) ii.((ba*)+a*b)*abb	[4]
	c)	 Convert the above DFA into equivalent RE.	[3]