UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2021

Course: Formal Language and Automata Theory **Semester: III**
Program: B.TECH CS LLB **Time 03 hrs.**
Course Code: CSEG2024 **Max. Marks: 100**

Instructions:

SECTION A

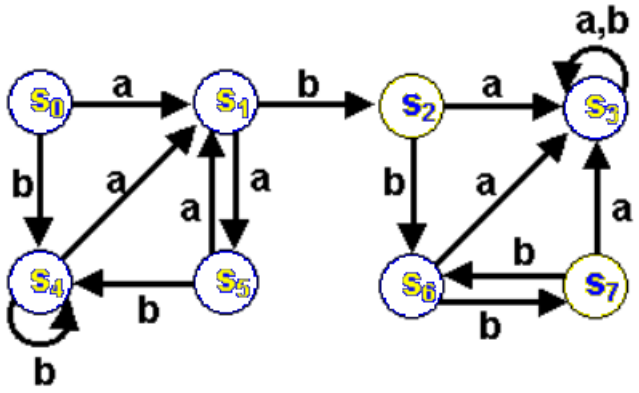
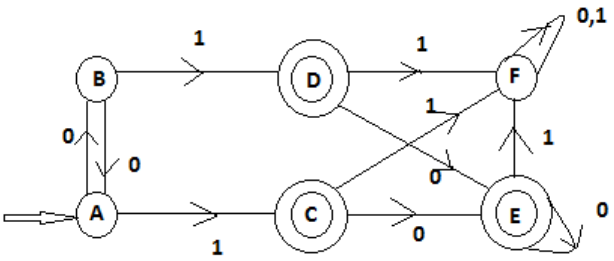
(5Q X 4M = 20 Marks)

S. No.	**Question**	**CO**
Q 1	Construct a DFA that is defined over ∑ = {a, b, c} that accepts all strings having consecutive "abc".	**CO 3**
Q 2	Construct a PDA that accepts all strings recognized by the language L = $\{a^n b^n, n > 0\}$	**CO 4**
Q 3	Explain what Left Recursion is and state how we can remove left recursion.	**CO 3**
Q 4	Differentiate between Mealey and Moore machines.	**CO 2**
Q 5	*"We need to use automata without outputs even though we have automata with outputs",* Comment.	**CO 1**

SECTION B

(4Q X 10M = 40 Marks)

Q 6	In order to find out a regular expression of a Finite Automaton, we use Arden's Theorem along with the properties of regular expressions. Statement – *"Let P and Q be two regular expressions. If P does not contain null string, then R = Q + RP has a unique solution that is R = QP*"* Prove the Arden's Theorem.	**CO 1**
Q 7	Construct a Mealey Machine that gives 2's compliment of any Binary Input. (Assume that the least carry bit as neglected).	**CO 1**
Q 8	Let L1 and L2 be two regular languages. Prove that the language L=L1 ∩ L2 is also regular. OR Reduce the following DFA:	**CO 2**

		
Q 9	Convert the following grammar G into Greibach Normal Form (GNF). S → XA|BB B → b|SB X → b A → a	**CO 3**
	SECTION-C **(2Q X 20M = 40 Marks)**	
Q 10	Answer the following questions i. Explain Regular Expressions and Finite Automata ii. Draw DFA which accepts even number of a's over the alphabet {a, b}. iii. Explain DFA State Minimization. iv. Explain the Limitations of Finite Automata	**CO 2**
Q 11	Explain the Myhill-Nerode Theorem. Apply the theorem to minimize the following given DFA.  Or Using Pumping Lemma for CFL prove that the following Grammar are NOT Context Free: 1. L = $\{a^n : n\ is\ prime\}$ 2. L = $\{a^n b^j : n \leq j^2\}$ 3. L = $\{w : n_a(w) < n_b(w) < n_c(w)\}$ 4. L = $\{a^k b^j c^k : k = jn\}$	**CO4**