

<b>Name:</b> <b>Enrolment No:</b>	
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**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**

**End Semester Examination, December 2022**

**Course: Formal Languages & Automata Theory**

**Semester: III**

**Program: B.Tech CSE (Hons.) All Branches**

**Time : 03 hrs.**

**Course Code: CSEG 2035P**

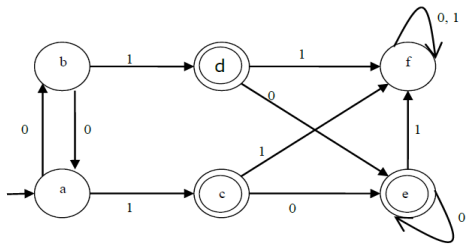
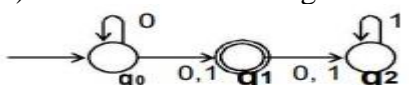
**Max. Marks: 100**

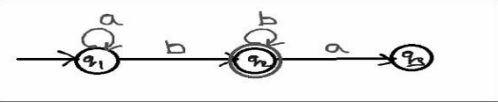
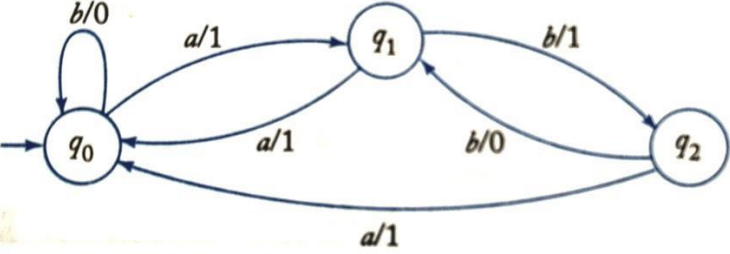
**Instructions:**

**SECTION A**  
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Prove that the complement of a regular language is also regular.	4	CO2
Q 2	Construct a DFA for the language over $\{0, 1\}^*$ such that it contains "000" as a substring.	4	CO1
Q 3	Construct a $\epsilon$ -NFA for the following regular expression. $(0+1)^*(00+11)(0+1)^*$	4	CO2
Q 4	State the pumping lemma for regular languages. Discuss the applications of regular expression?	4	CO2
Q 5	State the relations among regular expression, deterministic finite automata, non-deterministic finite automaton and finite automaton with epsilon transition.	4	CO1

**SECTION B**  
(4Qx10M= 40 Marks)

Q 6	<p>a) Minimize the DFA shown in the following diagram.</p> <div style="text-align: center;">  </div> <p>b) Convert the following NFA into an equivalent DFA.</p> <div style="text-align: center;">  </div>	<b>10</b>	<b>CO1</b>
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Q 7	Construct a regular expression for the given finite automata using state elimination method. <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">  </div>	<b>10</b>	<b>CO2</b>
Q 8	Convert the following grammar into an equivalent one with no unit productions and no useless symbols $S \rightarrow ABA$ , $A \rightarrow aAA aBC bB$ , $B \rightarrow A bB Cb$ , $C \rightarrow CC Cc$	<b>10</b>	<b>CO3</b>
Q 9	Convert the Mealy machine into equivalent Moore machine. <div style="text-align: center; margin: 10px auto;">  </div>	<b>10</b>	<b>CO1</b>
<b>SECTION-C</b> <b>(2Qx20M=40 Marks)</b>			
Q 10	a) Design a PDA automata which accepts $L = \{0^n 1^n \mid n \geq 1\}$ . b) Design a PDA for the grammar: $S \rightarrow aABC$ $A \rightarrow aB a$ $B \rightarrow bA b$ $C \rightarrow a$	<b>20</b>	<b>CO3</b>
Q 11	a) Design a Turing Machine that recognizes the language consisting of all strings of 0's whose length is a power of 2 i.e. $L = \{0^{2^m} \mid m \geq 0\}$ . b) Write short notes on the following: i) Recursive and Recursive enumerable language ii) Decidable and undecidable language	<b>20</b>	<b>CO4</b>