


<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**

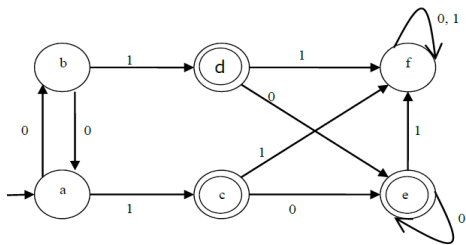
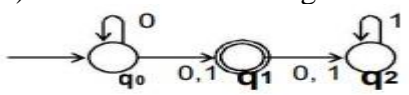
**Max. Marks: 100**

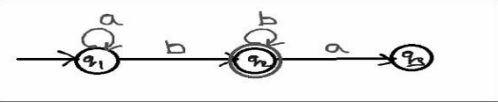
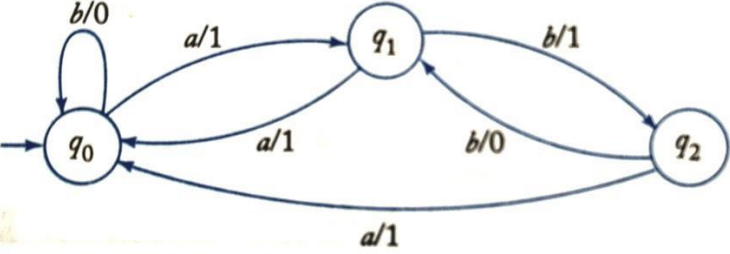
**Instructions:**

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

S. No.	Question	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	<p>Construct a regular expression for the given finite automata using state elimination method.</p> 	10	CO2
Q 8	<p>Convert the following grammar into an equivalent one with no unit productions and no useless symbols <math>S \rightarrow ABA</math>, <math>A \rightarrow aAA aBC bB</math>, <math>B \rightarrow A bB Cb</math>, <math>C \rightarrow CC Cc</math></p>	10	CO3
Q 9	<p>Convert the Mealy machine into equivalent Moore machine.</p> 	10	CO1
<p><b>SECTION-C</b> (2Qx20M=40 Marks)</p>			
Q 10	<p>a) Design a PDA automata which accepts <math>L = \{0^n 1^n \mid n \geq 1\}</math> .  b) Design a PDA for the grammar: <math>S \rightarrow aABC</math>  <math>A \rightarrow aB \mid a</math> <math>B \rightarrow bA \mid b</math> <math>C \rightarrow a</math></p>	20	CO3
Q 11	<p>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. <math>L = \{0^{2^m} \mid m \geq 0\}</math> .  b) Write short notes on the following:  i) Recursive and Recursive enumerable language  ii) Decidable and undecidable language</p>	20	CO4