Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

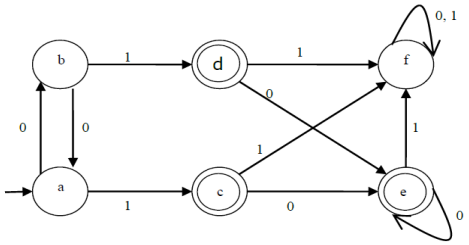
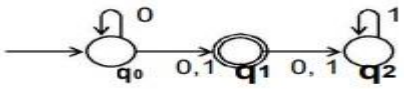
Course: Formal Languages & Automata Theory
Semester: III
Program: B.Tech CSE (Hons.) All Branches
Time : 03 hrs.
Course Code: CSEG 2035P **Max. Marks: 100**

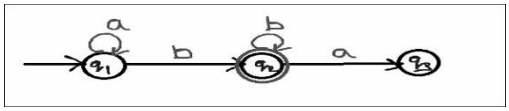
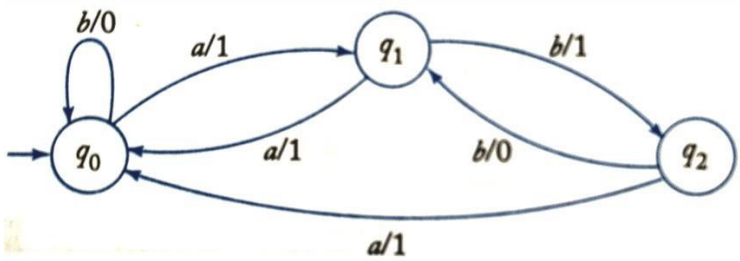
Instructions:

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 ε-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	a)Minimize the DFA shown in the following diagram.  b) Convert the following NFA into an equivalent DFA.  	**10**	**CO1**

Q 7	Construct a regular expression for the given finite automata using state elimination method. 	**10**	**CO2**
Q 8	Convert the following grammar into an equivalent one with no unit productions and no useless symbols S→ABA ,A→aAA|aBC|bB, B→ A|bB|Cb, C→CC|Cc	**10**	**CO3**
Q 9	Convert the Mealy machine into equivalent Moore machine. 	**10**	**CO1**
SECTION-C **(2Qx20M=40 Marks)**			
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: $S \rightarrow aABC$ $A \rightarrow aB \mid a$ $B \rightarrow bA \mid b$ $C \rightarrow a$	**20**	**CO3**
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	**20**	**CO4**