Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2018

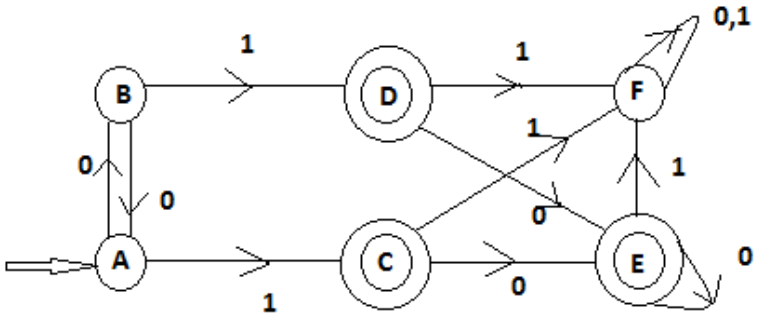
Course: Formal Language and Automata (CSEG345)
Semester: V
Programme: B.Tech (CS+All IBM courses)
Time: 03 hrs. **Max. Marks: 100**

SECTION A

S. No.		Marks	CO
Q 1	Draw the state diagram for NFA accepting language L= (ab)* (ba)* U aa*.	4	CO1
Q 2	Prove that the PDA that accept strings through empty stack and final state mechanism are equivalent.	4	CO2
Q 3	Design a FA that accepts strings containing exactly 1 over alphabet {0, 1}.	4	CO1
Q 4	"NPDA is more powerful than DPDA but DPDA is more efficient then NPDA" justify the statement with example.	4	CO2
Q 5	How do you define Instantaneous Description for Turing Machine?	4	CO3

SECTION B

Q 6	Prove that the problem of determining whether a given context-sensitive language is context-free is unsolvable.	10	CO4
Q 7	Convert the following grammar in to CNF: S → AACD A → aAb C → aC|a D → aDa | bDb | ε	10	CO2
Q 8	Give the moore machine for the input from (0+1+2)* which prints the residue module 5 of the input treated as a ternary (base 3, with digits 0,1,2) number. Convert it into mealy machine.	10	CO1
Q 9	Write transition rules for a PDA corresponding to the following Context Free Language: L = { wcw^R | w is in (0+1)* and w^R represents reverse w}. Also, obtain Context Free grammar for this PDA.	10	CO2

	OR Design a PDA that will accept the following language L= { $a^i b^j c^k$ | j = i+k }		
	SECTION-C		
Q 10	Construct Turing machine to accept the language L= { $0^n1^n2^n$ | n>=0 }.	**20**	**CO3**
Q 11	Explain the Myhill-Nerode Theorem. Apply the theorem to minimize the following given DFA.  **OR** Write the CFG for the following language: i) L= { $0^i 1^j 2^k$ | i=j or j = k } ii) L = { $a^n b^m c^m a^n$ | n, m >= 1}	**20**	**CO1**

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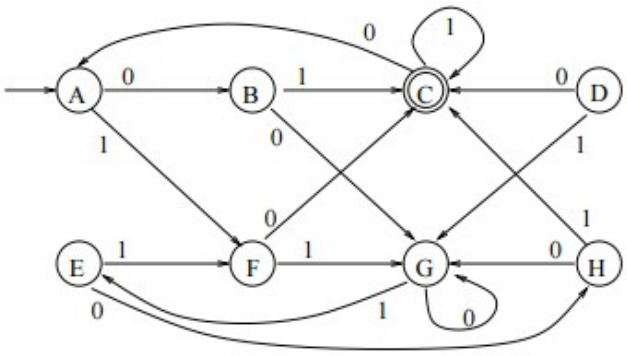
SECTION A

S. No.		Marks	CO
Q 1	Prove that the Language L = { $a^n b^m$ | m ≠ n } is not regular by using Pumping Lemma.	4	CO1
Q 2	Differentiate One Stack PDA and Two Stack PDA.	4	CO2
Q 3	Write a regular expression for the language containing all strings of 0 and 1 that begin with 1 and contain even number of 0.	4	CO1
Q 4	NPDA is not equivalent DPDA in terms of language recognition. Explain.	4	CO2
Q 5	Justify the statement "Turing machine is a language acceptors".	4	CO3
	SECTION B		
Q 6	Explain Church's Thesis.	10	CO4
Q 7	Convert the following grammar in to CNF: S → ABA A → aA| ε B → bB | ε	10	CO2
Q 8	Give the moore machine, which calculate residue mod-4 for each binary string treated as binary integer.	10	CO1
Q 9	Construct PDA to accept the language. L= { $a^n b^{2n}$ | n>=1}. **OR** Design a PDA that will accept the following language L= { $a^i b^j c^k$ | j=i+k }	10	CO2
	SECTION-C		
Q 10	Design a Turing Machine that recognizes the language of all strings of even length over alphabet {a,b}.	20	CO3
Q 11	Construct a minimum state automaton for the following DFA-	20	CO1



OR

Write the CFG for the following language:

i) $L = \{0^i 1^j 2^k \mid i=j \text{ or } j = k\}$

ii) $L = \{a^n b^m c^m a^n \mid n, m >= 1\}$