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PES UNIVERSITY, BENGALURU-560100

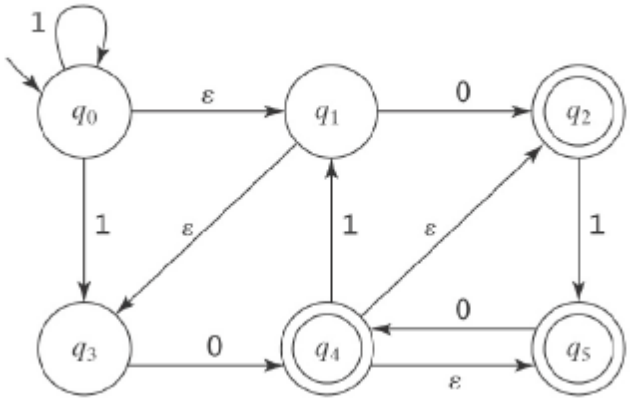
(Estd. Under Karnataka Act 10 of 2013)

UE18CS254

April 2020: (ESA) Model paper - BTech 4th Sem

UE18CS254 – Theory of Computation

Time: 3 Hrs **Answer All Questions** Max Marks: 100

1.	a)	What is alphabet and strings and language? Explain with examples. Explain following functions on strings with example: • Length • Concatenation • Replication • Reversal	8
	b)	Define Deterministic Finite Automata . Design DFA for the following languages: 1) L={ w: w is the string representation of Floating Point numbers} a. FP no is optional sign, followed by decimal no, followed by optional exponent. b. Decimal no of the form x or x.y (33 or 33.54) c. Exponent begins with E , followed by optional sign and integer. d. Integer is nonempty string of decimal digits.	3+ 4
	c	Prove, If w and x are strings then $(wx)^R = x^R w^R$	5
2.	a)	Design DFSM for the following languages and write all the five tuples. i) L = { w contains {0, 1}* , accepting Binary number divisible by 3} ii) L = {w contains {a, b}* : w has both aa and bb as a substrings}.	8
	b)	Convert the given NFA to equivalent DFA  	8
	c)	Write regular expression for L = {w ε {a,b}*|w = $a^{2n}b^{2m}$|n >= 0, m >= 0 } L = {w ε {a,b}*|w does not end in ba }	4
3.	a)	What is Context Free Grammar? Write CFG for the balanced parenthesis language.	5+ 5

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	b)	Consider the following grammar G: $S \rightarrow 0S1 \mid SS \mid 10$ Show the parse tree produced by G for each of the following strings: 1) 010110 2) 00101101 What is ambiguous grammar?	5+5
4.	a)	Define PDA. Build a PDA to accept the following language $L = \{ a^n b^m a^n : n,m \geq 0 \text{ and } m \text{ is even} \}$	2+6
	b)	Define a deterministic PDA. Build a PDA to accept the following language $\{a^n b^m : m \leq n \leq 2m\}$.	2+4
	c	State Pumping Lemma and Prove $L = \{ a^n b^n c^n : n>=0 \}$ is not a Context Free language	6
5.	a)	Define Turing Machine. Design a Turing Machine that accepts the language denoted by Regular expression 00*.	4+4
	b)	Design and draw a Turing Machine for $L = \{ a^n b^n c^n : n>=0 \}$. Write a note on "CHURCH- TURING Thesis".	4+2
	C	Define PCP and Obtain the solution for the following system of PCP A = {1, 10111, 10} and B = {111, 10, 0}.	2+4