SRN | | | | | | | | | | | | |

PES UNIVERSITY, BENGALURU

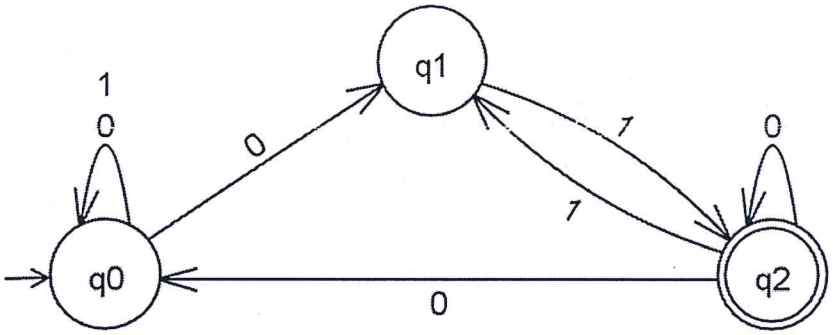
(ESTABLISHED UNDER KARNATAKA ACT NO. 16 OF 2013)

UE17CS254

MAY 2019: END SEMESTER ASSESSMENT (ESA) B.TECH. IV SEMESTER

UE17CS254–THEORY OF COMPUTATION

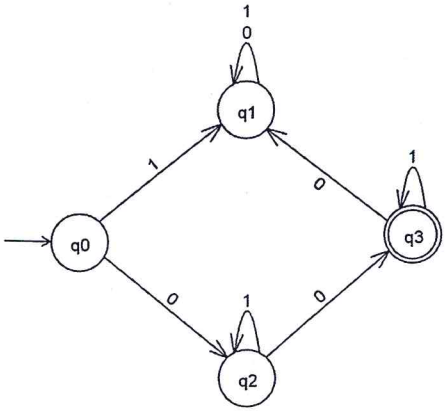
TIME: **3 HRS.** **ANSWER ALL QUESTIONS** MAX MARKS:**100**

1.	a)	Define the following terms: i. Alphabet ii. Transition function iii. Grammar iv. Language	04
	b)	Construct a DFA to accept strings over {a, b} not ending with abb.	04
	c)	Convert the following NFA to its equivalent DFA using subset construction method: 	06
	d)	Minimize the following DFA using table filling algorithm:	06

States	→A	B	*C	D	E	F	G	H
0	B	G	A	C	H	C	H	G
1	F	C	C	G	F	G	F	C

2.	a)	Construct regular expressions for the following languages: i. L = {w | w ∈ {a, b}* and w has exactly one pair of consecutive a s} ii. L = {$a^n b^m$: n ≥ 3, m is odd} iii. Set of all strings over {a, b}* not ending with the substring 'ab'.	06
	b)	Using pumping lemma, show that the formal language of addition is not regular. For convenience, r = p + q is represented as $a^p b^q c^r$.	06
	c)	Obtain regular expression for the following DFA using state elimination technique:	08

SRN | | | | | | | | | | | | | |



3.	a)	Can every linear grammar be converted to a form in which all productions look like A → ax, where a ∈ T, x ∈ V U {λ}. Justify your answer.	02
	b)	Remove λ–productions, unit–productions, and useless productions from the following grammar: S → aA | aBB A → aaA | λ B → bB | bbC C → B What language does this grammar generates?	08
	c)	Convert the following grammar into Greibach Normal Form: S → ABb | a | b A → aaA | B | λ B → bAb	06
	d)	Find an S–grammar for the following: i. $L = \{a^n b^n : n \geq 2\}$ ii. $L = \{a^n b^{n+1} : n \geq 1\}$	04
4.	a)	Construct an NPDA that accepts the following language over Σ = {a, b, c}: $L = \{a^n b^{n+m} c^m : n \geq 0, m \geq 1\}$	06
	b)	Discuss the steps involved in converting CFG to PDA & convert the following CFG to PDA. S → aSSSab | λ	10
	c)	State and prove pumping lemma for context–free languages.	04
5.	a)	Design a Turing Machine that reads a string representing a binary number and erases all leading 0's in the string. However, if the string comprises of only 0's, it keeps the least significant 0.	06
	b)	Let M be a Turing machine defined by the following transition table: (□ = blank)	06

SRN | | | | | | | | | | | | | |

δ	□	a	b	c
→q0	q1, □, R			
q1	q2, □, L	q1, a, R	q1, c, R	q1, c, R
*q2		q2, c, L		q2, b, L

i. Trace the computation for the input string □**aabca**□
ii. Give the state diagram of M.
iii. Describe the result of a computation in M.

c) Write short notes on: 08
i. Universal Turing machine
ii. Post correspondence problem

*****