SVKM'S NMIMS
MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT & ENGINEERING

Programme : B. Tech (COMPUTER) Year : III Semester : V
Batch : 2014-2015/ 2015-2016
Academic Year : **2016-2017**

Subject : Theoretical Computer Science

Date : 24 November 2016

Marks : 60
Time : 2.00 pm to 5.00 pm
Duration : 3 (hrs)

Re-Examination

Instruction: Candidates should read carefully the instructions printed on the question paper and on the cover of the Answer Book, which is provided for their use.

NB:
1) Question No. **ONE** is compulsory.
2) Out of remaining questions, attempt any **FOUR** questions.
3) In all **FIVE** questions to be attempted.
4) All questions carry equal marks.
5) Answer to each new question to be started on a fresh page.
6) Figures in brackets on the right hand side indicate full marks.
7) Assume Suitable data if necessary.

Q.1 a Match all items in Group 1 with correct options from those given in Group 2. 03

	(G1)		(G2)
1.	$Q \times \sum \rightarrow Q$	a.	DFA
2.	$Q \times \sum \rightarrow 2^n$	b.	Multi-tape turing machine
3.	$Q \times \Gamma \rightarrow (Q \times \Gamma \times \{L,R,H\}$	c.	Turing Machine
4.	$Q \times \Gamma^k \rightarrow (Q \times \Gamma^k \times (L,R,H)^k)$	d.	NFA
5.	$Q \times (\sum \cup \{\lambda\} \times \Gamma \rightarrow (Q, \Gamma)$	e.	Two –stack PDA
6.	$Q \times (\sum \cup \{\lambda\} \times \Gamma \times \Gamma' \rightarrow (Q, \Gamma, \Gamma')$	f.	PDA

b Choose the correct option with justification. 03

i. Which one of the following is FALSE?

i. There is unique minimal DFA for every regular language.
ii. Every NFA can be converted to an equivalent PDA.
iii. Complement of every context-free language is recursive.
iv. Every nondeterministic PDA can be converted to an equivalent deterministic PDA.

ii The turing machine accepts

i. Regular language
ii. Context free language
iii. Context sensitive language
iv. All of these

iii Given an arbitrary non-deterministic finite automaton (NFA) with N states, the maximum number of states in an equivalent minimized DFA is at least.

i. N^2
ii. 2^N
iii. 2N
iv. N!

c Answer the following and justify in short. 06

i Find the highest type of the following grammar

$S \rightarrow aS/A$, $aS \rightarrow aa$, $A \rightarrow a$.

ii Find the languages generated by the following grammar.

$S \rightarrow 0S1/0A1$, $A \rightarrow 1A/1$.

iii Construct the grammar for the language

0^m1^n, where $m \geq 1$ and $n \geq 1$ and $m < n$.

Q.2 a Construct an FA accepting all strings in {0,1}* having even number of 0's. 06

b Apply the theorem of Pumping Lemma to prove that the following language L is regular. 06

$L = \{ a^{2n} \mid n>=1 \}$

Q.3 a For a left linear grammar given below, obtain an equivalent right linear grammar. 06

$S \rightarrow S10|A1$

$A \rightarrow A00|00$

b Convert following grammar into CNF 06

$S \rightarrow abAB$

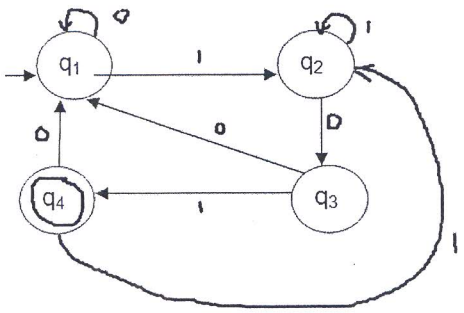
$A \rightarrow bAB/\epsilon$

$B \rightarrow BAa/\epsilon$

Q.4 a Consider the Mealy describe by transition table given by construct to Moore machine which is equivalent Mealy machine by the transitional format. 06

	I/P =0		I/P =1	
Present State	Next State	Output	Next State	Output
A	C	0	B	0
B	A	1	D	0
C	B	1	A	1
D	D	1	C	0

b Construct an RE from the given FA in Fig. by the algebraic method using Arden's theorem 06



Q.5 a Design the accepting string { WW^R where W ∈ (a,b)* and W^R is the reverse of W} by the empty stack and by the final state. 06

b Design a PDA for the language L={ $a^n b^{2n}$, where n≥1 } by empty stack and by final stack. 06

Q.6 a Design the TM to accept the language L=$a^n b^n$, where n>=1. 06

b Prove that. multi-tape Turing machine has an equivalent single-tape turing machine 06

Q.7 a Explain Kuroda Normal form. 04

b Convert the following NFA with €- moves to equivalent DFA. 08