Examination	: Second Session	**Seat No.**	:	
Date	: 4/08/2018	**Day**	:Tuesday	
Time	: 11:45 to 1:00	**Max. Marks**	: 36	

INSTRUCTIONS:

1. Figures to the right indicate maximum marks for that question.

2. The symbols used carry their usual meanings.

3. Assume suitable data, if required & mention them clearly.

4. Draw neat sketches wherever necessary.

Q.1 **Do as directed.**

(a) Consider CFG(context Free grammar) G1 given below . **[02]**
[02]
i) identify and describe mathematically the language it represents.

ii) Is G1 ambiguous? Prove your answer ,using parse trees.

G1 :-	$S \to AC \mid CB$	$A \to 0A1 \mid \varepsilon$	$B \to 1B0 \mid \varepsilon$	$C \to 0C \mid \varepsilon$

[02]

(b) Consider the following grammar G2:

G2 :-	$S \to 1 S 1 \mid T$	$T \to 1 X 1 \mid X$	$X \to 0 X 0 \mid 1$

What are the first four strings in the lexicographic enumeration of L(G) ?

(c) Give corresponding CFG for following Regular expression . **[02]**

$$0^{*} 1(0 \mid 1)^{*}$$

(d) Convert following CFG -G3 to Chomsky normal form (CNF). **[02]**

G3 :-	$S \to AAC$	$A \to aAb \mid \varepsilon$	$C \to aC \mid \varepsilon$

(e) Fill in the blanks:- **[02]**
I) if G is a CFG in CNF and x is string in L(G) , with $|x|= k$, then maximum _____
steps are needed in derivation of "x" in G .
 [2k , 2k-1, 2k+1, k]
ii) Context free languages are **not** closed under _____ operation
[union , intersection , Kleene star]

Q.2 **Attempt Any Two of following questions.**
(a) L = { a^{n} | n is a power of two } is not regular,using myhill -nerode theorem . **[06]**
(b) Prove that L={ w $\in$ {a, b}* | w = w^{R} } is not regular ,using pumping lemma . **[06]**

(c)   Minimize the FA given in below figure1 ,using table method .   **[06]**
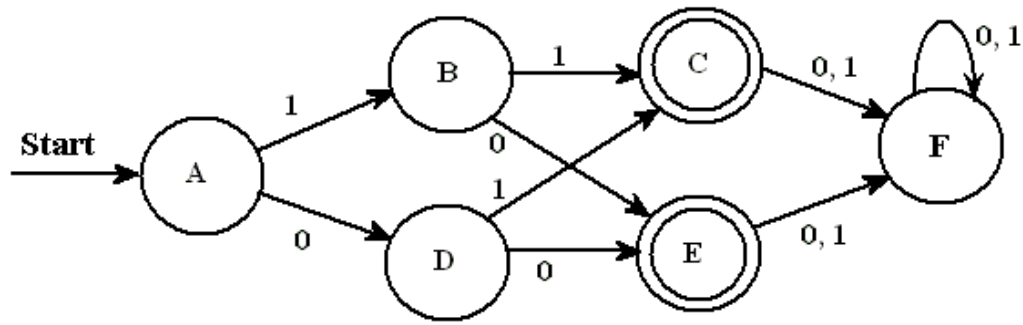

Figure 1

Q.3   Attempt following questions

(a)   Construct PDA(push down automaton) for palindrome string. DPDA
       (Deterministic PDA) is possible for palindrome? Justify your answer.   **[06]**

(b)   Prove following using example: **[06]**
       i) Intersection of regular language and CFL gives a new Context free langauge(CFL).
       ii) Concatenation of two CFL gives a resultant CFL only.

OR

Q.3   Attempt following questions

(a)   Construct a Deterministic Push-Down Automata for the given language.   **[06]**
       L= { x belongs to {a, b}* | $n_a(x) = n_b(x)$}

(b)   Construct CFG to PDA for given grammar and parse string "the song eats the   **[06]**
       cat".
       S → NP VP
       NP → the N
       VP → V NP
       V → sings | eats
       N → cat | song | canary

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