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BMS College of Engineering, Bangalore-560019

(Autonomous Institute, Affiliated to VTU, Belgaum)

July / August 2017 Supplementary Semester Examinations

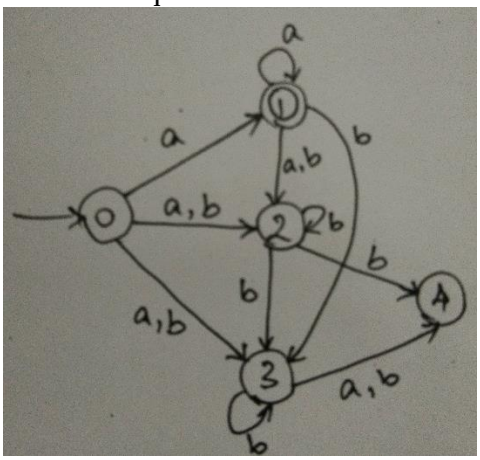
Course: **Theoretical Foundations of Computation** Duration: **3 hrs**
Course Code: **15IS3DCTFC/ 15IS3DCTFE** Max Marks: **100**
Date: 31.07.2017

Instructions: **1.Answer any five full questions choosing one from each unit.**
2. Assume missing data (if any) suitably

UNIT 1

1. a) Construct DFA for the languages **10**
   i. L={ w | w has an even number of a's and one or two b's}
   ii. L={ w | w ϵ {a,b,c}* and w contains the pattern "abac"}
   iii. L={ w | w is a binary string divisible by 4 }

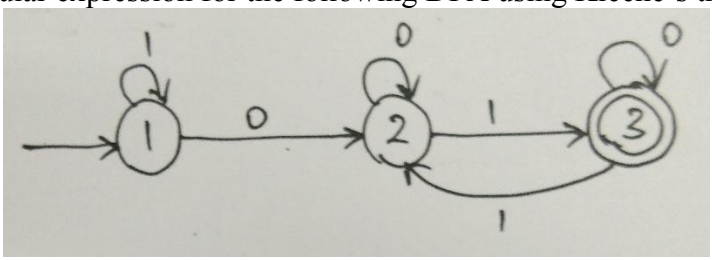
   b) Convert the following NFA to its equivalent DFA. **10**



UNIT 2

2. a) What is regular expression? Convert the regular expressions to its equivalent automata. **10**
   i. a(ba)*a*U a(ba)*b*
   ii. (0+1)*(011+01010)(0+1)*

   b) Obtain the regular expression for the following DFA using Kleene's theorem. **10**



OR

3. a) Show that L={$a^n b^l c^{n+l}$ |n, l ≥0} is not regular. **04**

b) Minimize the following DFA using Table-filling algorithm. **10**

δ	0	1
A	B	E
B	C	F
*C	D	H
D	E	H
E	F	I
*F	G	B
G	H	B
H	I	C
*I	A	E

c) Show that regular languages are closed under Intersection and Reversal. **06**

UNIT 3

4. a) Obtain CFG to generate the following languages **06**

i. L={ $(1010)(0101)^n(1001)(1100)^n$ | n ≥ 0}

ii. L={ $0^m1^m2^n$ | m ≥ 1, n ≥ 0}

b) Consider the CFG with the productions **09**

S→S+S | S-S | S*S | S/S | (S) | a

Write the leftmost derivation, rightmost derivation and parse tree for the strings

i. (a+(a+a)) + (a+a) ii.)a+(a*a)/a-a

c) Explain the YACC Parser-Generator with an example. **05**

OR

5. a) Show that the following CFG is ambiguous. **10**

S→ aB | bA

A → aS | bAA | a

B → bS | aBB | b

Also obtain the leftmost derivation for the string "$a^3b^2ab^3a$".

b) Eliminate useless symbols from the given grammar **04**

S→ aAa

A→ Sb | bCC |DaA

C→ abb |DD

E→ aC

D→ aDA

c) Find the grammar in CNF equivalent to the grammar **06**

S→ ~S | [S ⊃ S] | p| q

UNIT 4

6. a) Design a PDA for the following grammar **06**

S→ aA

A →aABC | bB | a

B → b

C → c

b) Define Pushdown Automata. Obtain a PDA to accept the language **08**

L= {w | w Є (a,b)* and $n_a(w) > n_b(w)$ }by a final state.

c) Obtain CFG for the PDA given below: **06**

$\delta(q_0, a, Z) = (q_0, AZ)$

$\delta(q_0, b, A) = (q_0, AA)$

$\delta(q_0, a, A) = (q_1, \varepsilon)$

UNIT 5

7. a) Obtain Turing Machine to accept the language **10**

$L = \{ ww^R \mid w \in (0,1)^* \}$

b) Explain Post Correspondence Problem. Let A= {11,100,111} and B= {111, 001, 11} **10**
Does the pair (A, B) have PC-Solution? Does it have an MPC solution?

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