Code No: 09A40504 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B.Tech II Year II Semester Examinations, November/December - 2013
FORMAL LANGUAGES AND AUTOMATA THEORY
(COMPUTER SCIENCE AND ENGINEERING)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

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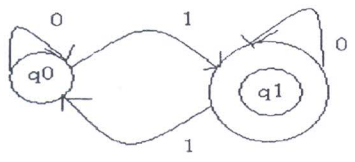
1.a) Design DFA for the following languages shown below: $\Sigma = \{a, b\}$
i) L={w/w does not contains the sub strings ab}.
ii) L={w/w contains neither the sub strings ab nor ba}
iii) L={w/w is any string that doesn't contain exactly two a's }

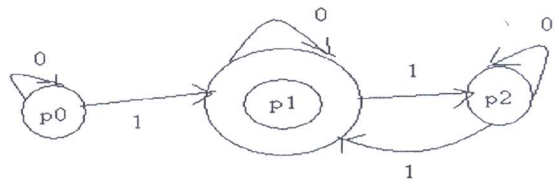
b) Design a NFA for the following
i) L={ $abaa^n$ / $n \geq 1$ }
ii) To accept language of all strings with **2 a's** followed by **2 b's** over **{ a , b }**
[7+8]

2.a) Minimize the given DFA:

S	0	1
→A	B	C
B	D	C
C	B	E
(D)	D	E
(E)	D	E

b) Show that the FA are equivalent [7+8]





3.a) Obtain a regular expression to accept strings of a's and b's such that every block of four consecutive symbols contains at least two a's.

b) Discuss closure properties of regular sets. [7+8]

4.a) Obtain a CFG to
i) Generate unequal number of a's and b's.
ii) Balanced set of parentheses (i.e., every left parentheses should match with the corresponding right parentheses).

b) Show that the following grammar generates the set of all arithmetic expressions in infix notation
E→ E+E | E*E | E/E | (E) | I [7+8]

5.a) Discuss about
i) Context Free Grammar
ii) Left most derivation
iii) Right most derivation
iv) Derivation tree

b) Convert the following grammar to Chomsky Normal Form
S→ bA | aB
A→ bAA | as | a
B→ aBB | bS | b [7+8]

6.a) Define Push Down Automata. Construct Push Down Automata accepting the following language
$L = \{ a^n b^n / n \geq o \}$

b) Convert the following Push Down Automata to Context Free Grammar
M= ({q0,q1},{a,b}{z0,za},δ,q0,z0,φ)
where δ is given by
δ (q0,a,z0) =(q0,za z0)
δ (q0,a,za) =(q0,za za)
δ (q0,b,za) =(q1,Є)
δ (q1,b,za) =(q1,Є)
δ (q1, Є,z0) =(q1,Є) [7+8]

7.a) Design Turing Machine which will compare two numbers **m** and **n** represented in unary format and produces output **'G'** for **m>n**, **'L'** for **m<n** and **'E'** if **m=n**

b) i) Design Turing Machine for $L=\{ 0^n 1^m | m,n \geq 1 \}$
ii) Draw the transition design for above L
iii) Verify L for strings
(1) 00111
(2) 00110
(3) 00001 [7+8]

8.a) What is Post Correspondence Problem? Explain.

b) Construct LR(0) items for the grammar given find it's equivalent NFA
S → aSA | b
A → Ab | a [7+8]

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7.a) Obtain the Fourier expansion of the given waveform shown in Figure 6.

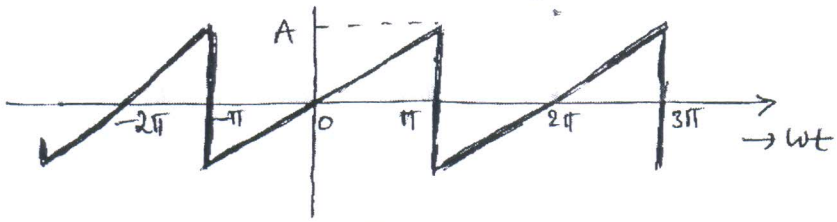

Figure 6

b) Find the line spectrum of the waveform shown in Figure 7 using Fourier analysis. [15]

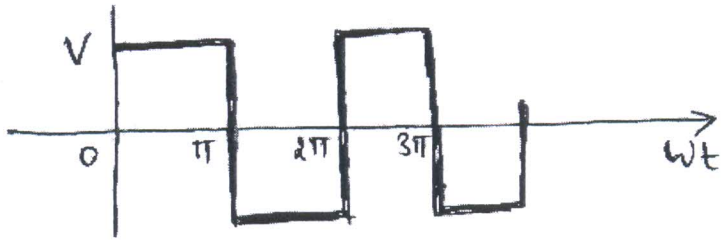

Figure 7

8.a) Find the pole-zero plot of the given network shown in Figure 8.

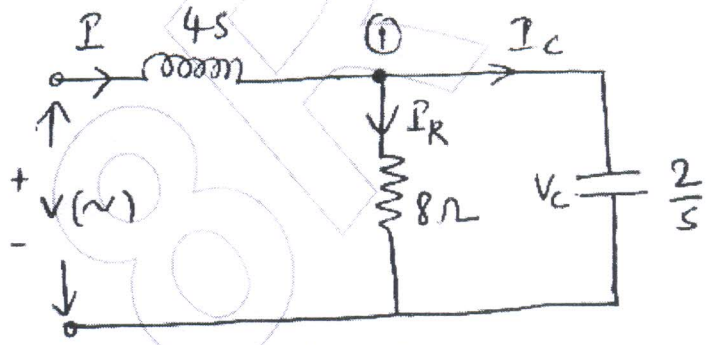

Figure 8

b) Find the transfer function of the network shown in the Figure 9. [15]

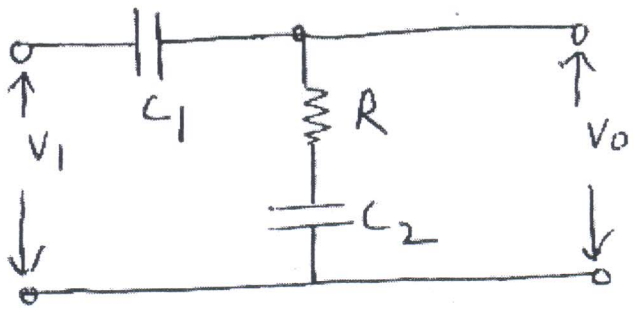

Figure 9

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